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# SELECTED **WATER RESOURCES ABSTRACTS**



VOLUME 11, NUMBER 22  
NOVEMBER 15, 1978

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CODEN: SWRABW

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# SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology,  
U.S. Department of the Interior



**VOLUME 11, NUMBER 22**  
**NOVEMBER 15, 1978**

W78-10501 -- W78-11300

The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department.

ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

# SELECTED WATER RESOURCES ABSTRACTS

**A**s the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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**S**electd Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus**. Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

**Selected Water Resources Abstracts** is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstract-

ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center  
Office of Water Research and Technology  
U.S. Department of the Interior  
Washington, DC 20240

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## 2. WATER CYCLE

### 2A. General

**OPTIMAL IDENTIFICATION OF NONLINEAR SURFACE RUNOFF SYSTEMS WITH COPOSITIVITY THRESHOLD CONSTRAINTS**, Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Industrial and Management Engineering. For primary bibliographic entry see Field 2E. W78-10515

**EFFECTS OF URBAN DEVELOPMENT ON THE FLOOD-FLOW CHARACTERISTICS OF THE WALNUT CREEK BASIN, DES MOINES METROPOLITAN AREA, IOWA**, Geological Survey, Iowa City, IA. Water Resources Div. For primary bibliographic entry see Field 4C. W78-10633

**A PROGRESS REPORT ON ESTUARY MODELING BY THE FINITE-ELEMENT METHOD**, Geological Survey, Reston, VA. Water Resources Div. For primary bibliographic entry see Field 2L. W78-10648

**CALIBRATION AND SENSITIVITY ANALYSIS OF THE CONTINUOUS RUNOFF SIMULATION MODEL 'STORM'**, Purdue Univ., Lafayette, IN. Water Resources Research Center. J. Luc Sautier, and J. W. Delleur. Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 818. Price codes: A05 in paper copy, A01 in microfiche. Report No. 103, May 1978. 67 p, 33 fig, 5 tab, 4 ref, 2 append. OWRT B-083-IND(5) and C-6106(N0. 5213)(3).

**Descriptors:** \*Rainfall-runoff relationships, \*Urban hydrology, \*Storm runoff, Urban drainage, Hydrologic models, Computer models, \*Model studies, \*STORM, Urban runoff model.

The hourly continuous runoff simulation model 'STORM' provides a substantial improvement over the elementary rainfall-runoff transformations without being so sophisticated as to become cumbersome. Using the composite runoff coefficient method in an urban watershed and the Soil Conservation Service method for the pervious areas in a semi-urban watershed, a methodology is developed to calibrate the parameters characterizing the equations relating to each of these methods. A sensitivity analysis of the model is done around the calibration values of the parameters. In an urban area, the runoff coefficient for impervious surfaces is a decisive parameter. The relative error in the runoff is of the same magnitude as the relative error in the parameter. In semi-urban areas the decisive parameter is the maximum soil moisture retention capacity. The two methods of analysis show that the yearly total amount of runoff, the total amounts by storm events and the peaks by event are all good and stable estimates. The choice of the method depends on the percent of imperviousness. (Wiersma-Purdue) W78-10660

**A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME IV, TURBULENT ENERGY COMPUTATION**, Rand Corp., Santa Monica, CA. For primary bibliographic entry see Field 2L. W78-11209

**A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME V, TURBULENT ENERGY PROGRAM**, Rand Corp., Santa Monica, CA. For primary bibliographic entry see Field 2L. W78-11210

### 2B. Precipitation

**CHARACTERISTICS OF PRECIPITATION DURING MONSOON SEASON IN KHUMBU HIMAL**, Nagoya Univ. (Japan). Water Research Inst. Y. Ageta.

In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 84-88, 1976. 7 fig, 6 ref.

**Descriptors:** \*Precipitation(Atmospheric), \*Mountains, \*Asia, On-site investigations, Monsoons, Spatial distribution, Temporal distribution, Rainfall, Snowfall, Glaciers, Watersheds(Basins), Orography, Seasonal, Meteorology, Climatology, Foreign countries, Foreign research, \*Himalaya Mountains, \*Nepal, \*Kumbu Region(Nepal).

During the monsoon season, when most of the annual precipitation concentrates in the Nepal Himalayas, precipitation was measured at 50 points in the Imja river catchment. Meteorological observations were made at a small glacier near a ridge and at Lhajung near the bottom of the valley for the comparison of the orographic effect between the two points. It was found from these observations that while monsoon activity from the southern foot of the Himalayas decreased approaching the interior of the main range of the Himalayas, precipitation increased at some of the higher places in the interior of the range. Precipitation occurred mainly in the daytime around the ridge but in the nighttime around the bottom of the valley. These characteristics are explained by the simplified pattern of diurnal variation of clouds caused by the local circulation associated with orographic convection. It also was found that precipitation was more in the drainage on the left side of the upper wind than in the neighboring windward drainage. Observational results of the phase (solid or liquid) of summer precipitation on the glacier were presented. (Sims-ISWS) W78-10510

**SNOW CRYSTALS OBSERVED AT LHJUNG STATION IN KHUMBU REGION**, Nagoya Univ. (Japan). Water Research Inst. For primary bibliographic entry see Field 2C. W78-10511

**CLIMATE OF HIDDEN VALLEY MUKUT HIMAL DURING THE MONSOON IN 1974**, Meteorological Service, Kathmandu (Nepal). Dept. of Irrigation, Hydrology and Meteorology. M. L. Shrestha, Y. Fujii, and M. Nakawo. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol. 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 105-108, 1976. 5 fig.

**Descriptors:** \*Monsoons, \*Climatic data, \*Mountains, \*Asia, Temperature, Air temperature, Precipitation(Atmospheric), Snowfall, Rainfall, Evaporation, Winds, Pressure, Atmospheric pressure, Climatology, Meteorology, Foreign countries, Foreign research, \*Himalaya Mountains, \*Nepal, \*Mukut Himal(Nepal), \*Hidden Valley(Nepal).

For the purpose of understanding climate of the glacier area of the northern side of the Himalayan range, a temporary station was set up at a height of

5,055 m in Hidden Valley, Mukut Himal, during the monsoon season of 1974. The temperature pattern, especially the trend of minimum temperature and the diurnal temperature range, seems to reflect the monsoonal character and to represent the temperature pattern effect better than the precipitation pattern. At the beginning and the end of the observation period, a rapid change of minimum temperature and a large temperature range were recorded, as opposed to the stationary trend of mean temperature from the middle of July to the middle of August, which seems to be the monsoon season in Hidden Valley. At the station, most of the precipitation was in the form of rain and rain-snow mixed. Nocturnal precipitation was more than daytime precipitation, which was less than 5 mm. The daily mean of evaporation slightly exceeded the daily mean of precipitation even in the monsoon period. The diurnal variation of atmosphere pressure shows two maxima and two minima. (Sims-ISWS) W78-10512

**AN INEXPENSIVE PRECIPITATION GAUGE**, New Mexico State Univ., University Park. Dept. of Agronomy. For primary bibliographic entry see Field 7B. W78-10523

**THE POTENTIAL PRIMARY PRODUCTIVITY OF PENINSULAR MALAYSIA**, Guelph Univ. (Ontario), Dept. of Geography. For primary bibliographic entry see Field 2D. W78-10650

**PROBABLE MAXIMUM PRECIPITATION ESTIMATES, COLORADO RIVER AND GREAT BASIN DRAINAGES**, National Weather Service, Silver Spring, MD. Office of Hydrology. E. M. Hansen, F. K. Schwarz, and J. T. Riedel. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Hydrometeorological Report No. 49, Sept. 1977. 173 p, 84 fig, 31 tab, 66 ref.

**Descriptors:** \*Precipitation(Atmospheric), \*Storms, \*Colorado River, \*California, \*Great Basin, \*Arizona, Hydrology, Estimating, Meteorology, Isohyets, Orography, Meteorological data, \*Precipitation estimates, \*Maximum probable precipitation, Orographic effects, Isohyetal patterns, Duration, Local storms, Rainfall observations, General storms, Convergence.

General storm probable maximum precipitation (PMP) estimates for durations from 6 to 72 hours and for area sizes between 10 and 5000 sq mi (26 and 12,950 sq km), were given for locations in the Colorado River and Great Basin drainages. Total PMP was determined as the sum of convergence and orographic PMP components. Estimates were given for each month. Estimates for local storm PMP also were provided, and the estimates were good for all of California. The estimates covered durations between 15 min and 6 h, and drainage areas between 1 and 500 sq mi (2.6 and 1,295 sq km). Local storm PMP was applicable to the warm season between May and October. Comparisons were given between PMP estimates and the greatest observed rainfalls of record, 100-year frequency rainfall, and statistically derived PMP. A step-by-step outline of the procedure for computing PMP estimates was presented with examples for both the general and local storm. (Roberts-ISWS) W78-10925

**COMPRESSED AIR SEEDING OF SUPER-COOLED FOG**, Army Terrestrial Sciences Center, Hanover, NH. For primary bibliographic entry see Field 3B. W78-10931



## Field 2—WATER CYCLE

### Group 2B—Precipitation

**RELATIONSHIP BETWEEN LAKE-INDUCED DISTURBANCES AND SYNOPTIC CIRCULATION,**  
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.  
For primary bibliographic entry see Field 2H.  
W78-10938

**LOCALLY HEAVY SNOW DOWNWIND FROM COOLING TOWERS,**  
National Weather Service Forecasting Office, Charleston, WV.  
For primary bibliographic entry see Field 4C.  
W78-10942

**CLIMATIC VARIATIONS IN THE SAHEL AND OTHER AFRICAN REGIONS DURING THE PAST FIVE CENTURIES,**  
National Center for Atmospheric Research, Boulder, CO. Advanced Study Program.  
S. E. Nicholson.  
Journal of Arid Environments, Vol. 1, No. 1, 1978, p. 3-24, 17 fig, 29 ref.

Descriptors: \*Climatology, \*Droughts, Geologic history, Palynology, Dendrochronology, Weather patterns, \*History, \*Sahel, \*Africa, Fluctuations, Variability, \*Arid lands.

The 1968-1973 drought in the African Sahel has generated much speculation concerning climatic fluctuations and trends on the African continent. This study reviews African climatic chronology for the past 5 centuries in an effort to analyze current ideas. Proxy data is used in reconstructing past environments which were determined by climatic elements, especially precipitation. Some of the techniques used were geologic and palynologic studies of lake-level variations, changes in stream regimes and deposits, tree rings and historical and geographical sources such as archives, chronicles, travel journals and colonial weather observations. Results of this extensive and interdisciplinary investigation indicated that the Sahel was significantly wetter from the 16th through the 18th centuries. Several severe droughts are evident beginning at 1680, although general trends indicate a humid condition until late in the 18th century. After this date, however, the Sahel began to develop its present arid climate, interrupted only in the late 19th century by a period of increased rainfall. This survey illustrates the complex historical development of the Sahelian climate and its bearing upon present fluctuations. (Tickes-Arizona).  
W78-10967

**RAINFALL, DROUGHT AND THE SOLAR CYCLE,**  
Haile Sellassie I Univ., Addis Ababa (Ethiopia). Geophysical Observatory.  
C. A. Wood, and R. R. Lovett.  
Nature, Oct. 18, 1974, Vol. 25, No 5476, p 594-596, 3 fig.

Descriptors: \*Droughts, \*Hydrologic cycle, \*Warning systems, Climatology, Meteorology, Precipitation (Atmospheric), India, Sahelian zone, Ethiopia, Climatic zones, Forecasting, Tropic regions.

The mid-1970s drought that devastated the Sahel, India, and Ethiopia has been explained elsewhere by Winstanly and Lamb who suggest that a slowly changing atmosphere is resulting in an equator-ward shift of the principal climatic belts. These shifts, thought to be part of a 200-year cycle, could make severe droughts more commonplace during the next 60 years. In Addis Ababa, however, the 11-year solar cycle seems to have more effect upon rainfall variation than these long term cycles. When applying this rainfall/sunspot cycle relationship to the Sahel, India, and other drought-afflicted areas of Africa, there are locations where the relationship is positive and locations where it is negative. If data from other areas substantiate this

relationship, they could provide an important warning during drought danger periods. (Tickes-Arizona).  
W78-10972

**CATTLE, RAINFALL AND TSETSE IN AFRICA,**  
Oxford Univ. (England). Animal Ecology Research Group.  
For primary bibliographic entry see Field 5G.  
W78-10975

**CENTENNIAL VARIATIONS OF GENERAL CIRCULATION AND THEIR RELATION TO DROUGHT IN NORTHERN MEXICO (VARIACIONES SEculares DE LA CIRCULACION GENERAL Y SU RELACION CON LA SEQUIA DEL NORTE DE MEXICO),**  
D. Klaus, and O. E. Jauregui.  
Recursos Hidraulicos, Vol. 4, No. 4, 1975, p 580-593, 12 fig, 20 ref.

Descriptors: \*Atmosphere, \*Air circulation, \*Droughts, Climatology, Precipitation (Atmospheric), Mexico, Intertropical convergence zone, Tropic, \*Climatic zones.

Alterations of general atmospheric circulation may be responsible for decreased summer rains in areas of northern Mexico. Zonal circulation predominated until the 1930's, characterized by western currents at 500mb upon which planetary waves of reduced amplitude travelled. A meridional circulation has prevailed since the thirties, displacing climatic zones toward the south. Displacement of the Intertropical Convergence Zone (ITC) toward the equator has resulted in a 50-60% reduction of precipitation in the exterior limits of the tropics. The recent droughts in the Sahel, in northern India, and in northern Mexico are a consequence of narrowed seasonal migrations of the Intertropical Convergence Zone. Precipitation will continue to be reduced during the next 50 years, in accordance with the existence of 200 year cycles in which zonal circulation alternates with meridional circulation. (Russell-Arizona).  
W78-10977

**DROUGHT AND THE NIGERIAN FARMER,**  
Ibadan Univ. (Nigeria). Dept. of Geography.  
J. Oguntuyinbo, and P. Richards.  
Journal of Arid Environments, Vol. 1, No. 2, June, 1978, p 165-194, 19 tab, 8 fig, 31 ref.

Descriptors: \*Droughts, \*Agroclimatology, Meteorology, Weather, Planning, Water resources development, Projections, Forecasting, Census, Social impact, Estimated benefits, \*Nigeria.

The importance of agro-meteorological research and advisory services to the farmers in the arid and semi-arid regions of Africa is presented here. Lack of data, personnel and proper communication channels are documented as major barriers to effective planning and prediction. Data for this study were obtained from interviews with approximately 30 farmers each in a number of selected localities from the Sahel savanna zone to the northern, drier part of the forest zone. The objective of this study was to compile a general picture of how Nigerian farmers saw and responded to the 1973 drought. Results indicated that drought in Nigeria has a longer history and more extensive geographical, social, and economic impact than before realized. Additionally it was found that while farmers are limited in their understanding of climatic origins of drought they are competent observers of climatic phenomena and possess an extensive and rational cultural apparatus of weather lore to help them adjust to it. These authors recommend the active involvement of the Nigerian farmers in agro-meteorological work, especially in the process of determining research and planning priorities. (Tickes-Arizona).  
W78-10979

**PROBABLE MAXIMUM RAINFALL FOR CONDITIONS OF IRAQ,**  
Ministry of Irrigation, Bagdad (Iraq).  
F. Y. El Yussif.  
Irrigation and Power, Vol 33, No 4, Oct 1976, p 529-539, 7 tab, 16 fig, 15 ref.

Descriptors: \*Iraq, \*Probable maximum precipitation, \*Time series analysis, Depth-area-duration analysis, Water management (Applied), Forecasting, Planning, On-site data collections, Hydrologic data, Measurement, Rainfall intensity.

Increased demands upon a limited water supply have caused a vital problem in the largely arid country of Iraq. Designers and planners have been greatly hindered by a lack of adequate data in their attempts to manage the country's water resources. This paper presents an analysis of the limited data collected at 6 sites for 20 years (1955-1975) in an attempt to illustrate the vital role of data collection in making intelligent decisions about water management. Accumulated and average yearly rainfall measurements for the 20-year period, collected at Bakraju, Mosul, Baghdad, Basrah, Hit, and Rutba, are given. Yearly ranges were found to be greatly irregular with maximum ranges from 1.68 to 2.17 and minimum ranges from .15 to .57. Statistical methods were applied to determine coefficients of variation of .54 in the arid regions and .28 in the more humid regions. Probable maximum rainfall for 100 years and 1000 years are presented. These authors recommend the establishment of more data collection points throughout the country, as well as an increase in the scope of data collected, i.e. frequency and intensity duration characteristics. (Tickes-Arizona)  
W78-10980

**SEDIMENT YIELD AS A FUNCTION OF CLIMATE IN UNITED STATES RIVERS,**  
For primary bibliographic entry see Field 2J.  
W78-11122

**ATMOSPHERIC BULK PRECIPITATION IN THE LAKE ERIE BASIN,**  
Canada Centre for Inland Waters, Burlington (Ontario).  
For primary bibliographic entry see Field 5A.  
W78-11195

**CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART A. EARTH SCIENCE IN CLIMATE RESEARCH.**  
Geological Survey, Menlo Park, CA. Geologic Div.  
Available from the Branch of Distribution, USGS 1200 S. Eads St. Arlington, VA, 22202. Circular 776-A, 1978. 15 p. Smith, G. I., Editor.

Descriptors: \*Climates, \*Effects, \*Water resources, \*Land use, \*United States, Coordination, Organizations, Planning, Conferences, Projects, Climatology, Precipitation (Atmospheric), Storms, Floods, Droughts, Winds, Temperature, Topography, Humidity, Erosion, Mudflows, Landslides, Avalanches, Hurricanes, U.S. Geological Survey, Geologic division, Water resources division, Office of Land Information and Analysis.

To better coordinate information being generated by the U.S. Geological Survey, a workshop was convened near Denver, Colo., on December 7-9, 1976, to exchange ideas about research that is oriented toward climate, climate variation, and the effects of climate on the Nation's land and water resources. This is the first circular of a three-part report resulting from that workshop. Hydrologic records provide information to the earth scientist about the responses of ground water, surface water, and glaciers to climatic change; geologic sequences provide evidence of earth-surface water, and glaciers to climatic change; geologic sequences provide evidence of earth-surface

responses to climatic change; biological records yield information about the effects of climatic change on the Earth's biota; archeological records tell us where and how man was able to live under changing climatic conditions; and historical records allow the specific effects of short-term changes in climate to be accurately documented. The interrelation between present and past geologic environments, various methods of study, and the span of time over which the results can be applied are shown in a table. (Woodard-USGS) W78-11263

#### CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART B. CURRENT RESEARCH BY THE GEOLOGICAL SURVEY.

Geological Survey, Menlo Park, CA. Geologic Div. Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202. Circular 776-B, 1978. 52 p. Smith, G. I., Editor.

Descriptors: \*Climates, \*Effects, \*Water resources, \*Land use, \*United States, Coordination, Organizations, Planning, Conferences, Projects, Climatology, Precipitation (Atmospheric), Storms, Floods, Droughts, Winds, Temperature, Topography, Humidity, Erosion, Mudflows, Landslides, Avalanches, Hurricanes, U.S. Geological Survey, Geologic Division, Water Resources Division, Office of Land Information Analysis.

To better coordinate information being generated by the U.S. Geological Survey, a workshop was convened near Denver, Colo., on December 7-9, 1976, to exchange ideas about research that is oriented toward climate, climate variation, and the effects of climate on the Nation's land and water resources. This is the second circular of a three-part report resulting from that workshop. This circular presents a summary of the types of work in progress in the Geological Survey and gives brief examples of the rationale and results of about 50 selected efforts. Many of these efforts are described in detail by one or more of the several hundred technical publications by Survey authors listed at the end of this report. The studies that are related to climate are divided into five categories: I. present climate-related processes and indices that provide baseline data for climatic interpretation; II. geologically short-term changes in climate; III. geologically longer term climate changes; IV. the areal distributions of past climates; and V. dating and correlation methods. (Woodard-USGS) W78-11264

#### CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART C. GEOLOGICAL SURVEY CLIMATE PLAN.

Geological Survey, Menlo Park, CA. Geologic Div. Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202, Circular 776-C, 1978. 15 p. Howard, K. A., and Smith, G. I., Editors.

Descriptors: \*Climates, \*Effects, \*Water resources, \*Land use, \*United States, Coordination, Organizations, Planning, Conferences, Projects, Climatology, Precipitation (Atmospheric), Storms, Floods, Droughts, Winds, Temperature, Topography, Humidity, Erosion, Mudflows, Landslides, Avalanches, Hurricanes, U.S. Geological Survey, Geologic Division, Water Resources Division, Office of Land Information and Analysis.

To better coordinate information being generated by the U.S. Geological Survey, a workshop was convened near Denver, Colo., on December 7-9, 1976, to exchange ideas about research that is oriented toward climate, climate variation, and the effects of climate on the Nation's land and water resources. This is the third circular of a three-part

report resulting from that workshop. This circular presents a summary of the workshop including an organization chart of the U.S. Geological Survey highlighting the three active participating units of the Survey: the Geological Division, Water Resources Division, and Office of Land Information and Analysis. An interdivision committee under the lead of the Geologic Division's Office of Environmental Geology is being established to ensure coordination of current and future climate-related research within the agency. (Woodard-USGS) W78-11265

## 2C. Snow, Ice, and Frost

### FLIGHT OBSERVATIONS FOR THE INVENTORY OF GLACIERS IN THE NEPAL HIMALAYAS,

Nagoya Univ. (Japan). Water Research Inst. K. Higuchi, T. Iozawa, and H. Higuchi. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 6-9, 1976. 3 fig, 1 tab, 2 ref.

Descriptors: \*Glaciers, \*Remote sensing, \*Aerial photography, Aircraft, Surveys, Photography, Mountains, Ice, Foreign countries, Foreign research, Snow, Glaciology, \*Himalaya Mountains, \*Nepal, \*Khumbu Region.

Air flights for photographing glaciers in Nepal Himalayas were carried out 8 times during the period from 1970 to 1975. The oblique aerial photographs of glaciers in the Khumbu region taken by these flights will be of aid when the glacier inventory by Muler and the maps hitherto published are compared, as a first step in the inventory study of glaciers in this region. (Sims-ISWS) W78-10502

### ON THE TYPES OF GLACIERS IN THE NEPAL HIMALAYAS AND THEIR CHARACTERISTICS,

Nagoya Univ. (Japan). Water Research Inst. O. Watanabe. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 10-16, 1976. 5 fig, 2 tab, 3 ref.

Descriptors: \*Glaciers, \*Classification, \*Mountains, Ice, Snow, Foreign countries, Foreign research, Surveys, Data processing, Analytical techniques, Glaciology, \*Glacier types, \*Himalaya Mountains, \*Nepal.

The glaciers in the Nepal Himalayas were classified into two types, 'Nepal type glaciers' and 'Tibet type glaciers'. The lowest elevation of the glaciers of the first type is lower than that of the second type. The length of the glaciers of the first type is longer than that of the second type. For both types, it was found that the length of glaciers in the Nepal Himalayas is longer in eastern Nepal than in western Nepal. (Sims-ISWS) W78-10503

### MASS BALANCE STUDIES OF THE GLACIERS IN HIDDEN VALLEY, MUKUT HIMAL,

Nagoya Univ. (Japan). Water Research Inst. Y. Fujii, M. Nakawo, and M. L. Shrestha. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 17-21, 1976. 4 fig, 5 ref.

Descriptors: \*Glaciers, \*Ablation, \*Surveys, On-site investigations, Mountains, Ice, Snow,

Precipitation (Atmospheric), Melting, Foreign research, Freezing, Melt water, Glaciology, \*Himalaya Mountains, Mass balance, Accumulation.

Accumulation and ablation measurements and stratigraphic studies were carried out on the Rikha Samba Glacier and Glacier G 3 in Hidden Valley, Mukut Himal, during the monsoon season of 1974. The summer balance over the whole area of the Rikha Samba Glacier was slightly positive. The winter snow layer observed as a dirt layer in a pit was so thin that the summer balance approximated the net balance. The total amount of precipitation over the area above the firn line in the glacier basin was very close to the summer balance over the accumulation area. The change from snow to ice occurred due to the formation of columnar ice with parallel projections to the surface in firn by the daily melting-refreezing cycle. (Sims-ISWS) W78-10504

### WATER DISCHARGE OF IMJA KHOLA IN KHUMBU HIMAL,

Nagoya Univ. (Japan). Water Research Inst. K. Higuchi, Y. Ageta, and H. Kodama. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University, Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 22-26, 1976. 5 fig, 4 ref.

Descriptors: \*Glaciers, \*Discharge (Water), \*Runoff, Mountains, Gaging stations, Watersheds (Basins), Rivers, Water levels, Melt water, Temperature, Air temperature, Monsoons, Precipitation (Atmospheric), Variability, Seasonal, Diurnal, Snow, Ice, Glaciology, \*Imja Khola (Nepal), \*Nepal, \*Himalaya Mountains.

Observations of water discharge from a drainage area of 142.5 sq km including glacier zones were made at Dingboche (4330 m) in east Nepal. The annual discharge of this drainage was estimated as  $1.7 \times 10$  to the 8th power cu m. The annual variation of the discharge showed a tendency to increase in summer and decrease in winter. It was assumed that precipitation during the monsoon season strongly contributes to high discharge in summer. On the basis of the data of ablation of glaciers and precipitation in this region, preliminary estimates of water balance in the drainage during a year were made. Since the variation of daily mean air temperature at Lhahung near Dingboche had a good correlation with the variation of daily discharge in summer but not in winter, the contribution of melt water from glaciers to the variation of the discharge also was discussed on the basis of the air temperature over glaciers estimated from the monthly mean temperature at Lhahung. Diurnal variations of the discharge in different months showed periodic tendencies which might be due to the diurnal variations at discharge of melt water from glaciers. The seasonal change of this tendency can be explained by the change of air temperature. Monthly discharge in depth of runoff from this drainage was compared with that at a point 460 m in altitude in the lower part of this drainage. The latter was nearly twice as much as the former during the monsoon season since precipitation in the upper drainage during the monsoon season is less than below. (Sims-ISWS) W78-10505

### WATER DISCHARGE OF RIKHA SAMBA KHOLA IN HIDDEN VALLEY, MUKUT HIMAL,

Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science. M. Nakawo, Y. Fujii, and M. L. Shrestha. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 27-30, 1976. 7 fig, 1 ref.

## Field 2—WATER CYCLE

### Group 2C—Snow, Ice, and Frost

**Descriptors:** \*Glaciers, \*Discharge(Water), \*Runoff, Mountains, Gaging stations, Rivers, Watersheds(Basins), Monsoons, Precipitation(Atmospheric), Temperature, Water temperature, Melt water, Suspended solids, Variability, Diurnal, Seasonal, Solar radiation, Snow, Ice, Glaciology, \*Himalaya Mountains, \*Nepal, \*Rikha Samba Khola(Nepal).

The water level of Rikha Samba Khola in Hidden Valley, Mukut Himal, was measured from July 16 to September 7, 1974. The discharge was estimated on the basis of a stage-discharge curve, giving a gradual decrease during the observational period. The amount of the suspended materials in the river was measured after sampling the river water at the sample place during the monsoon season of 1974. The amount also decreased gradually during this period. The daily variation of discharge and the amount of suspended materials shows a maximum around 1400 NST (Nepal Standard Time). (Sims-ISWS) W78-10506

#### THE FLOW OF GLACIERS IN THE KHUMBU REGION,

Nagoya Univ. (Japan). Water Research Inst. H. Kodama, and S. Mae. In: Collected Papers on Sciences of Atmosphere and Hydrosphere Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 31-36, 1976. 3 fig, 3 tab, 9 ref.

**Descriptors:** \*Glaciers, \*Flow, \*Movement, On-site investigations, Ablation, Melt water, Discharge(Water), Measurement, Variability, Seasonal, Glaciology, Foreign countries, Foreign research, \*Glacier flow, \*Himalaya Mountains, \*Nepal, \*Khumbu Region(Nepal).

The results of measurements of the surface velocity of the glaciers in the Khumbu region showed that the surface velocity underwent a seasonal variation in the upper parts of the ablation area of the Khumbu and the Nuptse glaciers, that is, the velocity from May to August was higher than that of the rest of the year. It was found that the surface of the Kongma Glacier moved upward, and this strange motion of the ice was discussed. The thickness of the Khumbu and the Nuptse glaciers was estimated using the theory of glacier flow to be 110 m and 70 m, respectively. The discharge of the Khumbu Glacier also was estimated to be 7.5, 3.4, 1.6 and approximately 0 million tons/year at the elevations of 5340 m, 5280 m, 5140 m, and 4960 m, respectively. Using these values and measured ablation rate, the increasing rate of the thickness of the Khumbu Glacier was obtained as follows, 1 m/year between 5340 m and 5280 m, 0.3 m/year between 5280 m and 5140 m, and -1.5 m/year between 5140 m and 4960 m. These results indicated that the Khumbu Glacier was not in equilibrium. (Sims-ISWS) W78-10507

#### ICE TEMPERATURE OF KHUMBU GLACIER,

Nagoya Univ. (Japan). Water Research Inst. S. Mae. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 37-38, 1976. 3 ref.

**Descriptors:** \*Glaciers, \*Temperature, \*Boreholes, Borehole geophysics, Ice, Measurement, Ablation, Spatial distribution, Drill holes, Drilling, Foreign countries, Foreign research, Glaciology, \*Glacier temperatures, \*Khumbu Glacier(Nepal), \*Nepal, \*Himalaya Mountains.

Thermal drilling was carried out in August 1974 on the Khumbu glacier. The drilling site was set at 5,360 m above sea level in the upper part of the

ablation area of the glacier. The drilling was stopped due to the freezing of the drilled hole at a depth of 20.3 m. The analysis of the relationship between the depth and the time of drilling indicated that there 7 layers down to the maximum depth reached and there was a possibility that the deepest layer was at the melting point. A simple calculation of the freezing rate of the drilled hole showed that the ice temperature at a depth of 2 m was below -2°C at the drilling time. The measurement of the resistance of a thermistor put into the hole showed that the ice temperature at a depth of 2.7 m was -5.3°C at the end of November. Therefore, it was concluded that the ice temperature above the deepest layer (its depth was 16 m) was below the melting point, but it was at the melting point below the layer. This conclusion was supported by the analysis of the flow velocity of the glacier. (Sims-ISWS) W78-10508

#### FLOW OF GLACIERS IN HIDDEN VALLEY, MUKUT HIMAL,

Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science. M. Nakawa, Y. Fujii, and M. L. Shrestha. In: Collected Papers on Sciences of Atmosphere and Hydrosphere Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 39-43, 1976. 6 fig, 1 tab, 5 ref.

**Descriptors:** \*Glaciers, \*Movement, \*Flow, On-site investigations, Measurement, Ablation, Snow, Ice, Glaciology, Foreign countries, Foreign research, \*Glacier flow, \*Himalaya Mountains, \*Nepal, \*Hidden Valley(Nepal).

Surface flow velocities of three glaciers in Hidden Valley, Nepal, were measured from the end of July to the end of August 1974. The Rikha Samba glacier, the largest one, moved 1-2 m/month, and an unnamed glacier near Tukhe Peak, the only debris-covered type glacier, showed movements of 0-0.5 m/month. But no movement was observed at all on a glacier-like ice mass close to the Rikha Samba glacier. (Sims-ISWS) W78-10509

#### CHARACTERISTICS OF PRECIPITATION DURING MONSOON SEASON IN KHUMBU HIMAL,

Nagoya Univ. (Japan). Water Research Inst. For primary bibliographic entry see Field 2B. W78-10510

#### SNOW CRYSTALS OBSERVED AT LHJUNG STATION IN KHUMBU REGION,

Nagoya Univ. (Japan). Water Research Inst. K. Higuchi. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 93-101, 1976. 9 fig, 18 ref.

**Descriptors:** \*Snow, \*Crystals, \*Precipitation(Atmospheric), \*Asia, Snowfall, Particle shape, Particle size, Sampling, Graupel, Rime, Cloud physics, Meteorology, Foreign countries, Foreign research, \*Himalaya Mountains, \*Nepal, \*Khumbu Region(Nepal).

The shape and size of snow crystals were recorded by making plastic replicas of them during the snowfall on 1, and 2 January, 1975, at Lhjung (4,420 m) in Khumbu region. It was found by observation of the photomicrographs of the replicas that the shapes of snow crystals during the period from 1900 to 2100 NST (Nepal Standard Time) 1 January were hexagonal plates, thick plates of skelton form, plates with simple extension, plates with dendritic extension, crystals with sector-like branches, crystals with broad branches, dendritic

crystals with plates at ends, hollow columns with plates, side planes, and graupel. The meteorological conditions in the precipitating clouds were estimated on the basis of the observations of snow crystals. During the period from 0750 to 0935 NST, 2 January, graupel, graupel-like snow of hexagonal type, and rimed crystals were observed. (Sims-ISWS) W78-10511

#### PERIGLACIAL PHENOMENA IN HIDDEN VALLEY, MUKUT HIMAL,

Nagoya Univ. (Japan). Water Research Inst. Y. Fujii. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 120-124, 1976. 7 fig, 1 tab, 6 ref.

**Descriptors:** \*Glaciers, \*Permafrost, \*Geomorphology, Mountains, Ice, Solifluction, Frost, Soils, Rocks, Geology, Foreign countries, Foreign research, \*Periglacial landforms, \*Hidden Valley(Nepal), \*Mukut Himal(Nepal), \*Nepal, \*Himalaya Mountains.

Periglacial landforms occur in the altitudinal range between the forest line and snow line in Hidden Valley and its southern outer slope. Since most of Hidden Valley is situated above the vegetation limit, sorted patterned ground and solifluction slopes cover vast areas, but vegetated patterned ground, such as earth hummocks and turf-banked terraces, is found only along the streams drained from glaciers. The occurrences of large sorted polygons and solifluction lobes are likely to be associated with the existence of permafrost. The occurrences of large sorted stripes on the supraglacial moraine seem to indicate that the glacier ice is stagnant in this part. The stripe pattern of small sorted stripes observed at 5,630 m starts to become clear on gradients of more than 5 deg and is still clear on gradients of 40 deg. The rate of mass movement was proportional to the square root of the gradient of the slope and ranged from 0.4 cm/day (150 cm/year) to 0.8 cm/day, greater with one or two digits than those previously reported. Such a high rate seems to be induced by both solifluction and frost creep and is intensified by soaked and loose states above permafrost table and by a steep slope angle. (Sims-ISWS) W78-10513

#### GROUND TEMPERATURE AND ITS RELATION TO PERMAFROST OCCURRENCES IN THE KHUMBU REGION AND HIDDEN VALLEY,

Nagoya Univ. (Japan). Water Research Inst. Y. Fujii, and K. Higuchi. In: Collected Papers on Sciences of Atmosphere and Hydrosphere, Water Research Institute of Nagoya University (Japan), Vol 14, 1976. Reprint from Journal of the Japanese Society of Snow and Ice, 38 Special Issue, p 125-128, 1976. 5 fig, 12 ref.

**Descriptors:** \*Permafrost, \*Temperature, \*Frozen ground, \*Asia, Mountains, Frozen soils, Soils, Frost, Glaciers, On-site investigations, Foreign countries, Foreign research, \*Himalaya Mountains, \*Hidden Valley(Nepal), \*Khumbu Region(Nepal), \*Mukut Himal(Nepal), \*Nepal.

In order to detect the existence of permafrost and to study its relation to ground temperature distribution in high altitude of the Himalayas, ground temperature measurements were carried out in the Khumbu region and Hidden Valley, Mukut Himal. The results indicated that permafrost occurs above 4,900-5,000 m in the Khumbu region and above 5,000 m in Hidden Valley. The lapse rates of the ground temperature at a depth of 50 cm below the surface are about 0.9-1.0 deg C/100 m and about 0.4 deg C/100 m above and below the lower altitudinal limit of permafrost distribution in both regions. (Sims-ISWS)



W78-10514

**INTERACTION BETWEEN BEDROCK AND PRECIPITATION AT TEMPERATURES CLOSE TO 0°C.**

Oslø Univ. (Norway). Dept. of Geology.  
For primary bibliographic entry see Field 2K.  
W78-10527

**CENTRAL AVALANCHE HAZARD FORECASTING. PHASE I - FEASIBILITY STUDY.**

Washington State Highway Commission, Olympia. Dept. of Highways.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 365. Price codes: A05 in paper copy, A01 in microfiche. Final Report, August 1975. 76 p, 1 fig, 2 tab, 11 ref, 1 append.

Descriptors: \*Avalanches, \*Hazards, \*Highways, \*Washington, Mountains, Snow, Snowfall, Snowpacks, Weather, Networks, Communication, Forecasting.

This report described the results of a feasibility study comprising Phase I of a Central Avalanche hazard Forecasting Program for mountain passes in the State of Washington. The report described existing weather and avalanche data sources, and it suggested improvements and additions for improved input to and feedback from a centralized avalanche forecaster's office which will improve avalanche predictions for all passes within the State. Washington State Department of Highways and consultant efforts and results during FY 75 were described, and specific recommendations for Phase II, implementation of avalanche hazard forecasting, were provided. An appendix contained a consultants' report that described a weather observation and reporting network for prediction of avalanche hazard conditions in the Cascade Mountains of Washington State. (Sims-ISWS)

W78-10536

**WATER REDISTRIBUTION IN PARTIALLY FROZEN, SATURATED SILT UNDER SEVERAL TEMPERATURE GRADIENTS AND OVERBURDEN LOADS.**

Guelph Univ. (Ontario). Dept. of Land Resources Science.  
J. P. G. Loch, and B. D. Kay.  
Soil Science Society of America Journal, Vol. 42, No. 3, p 400-406, May-June 1978. 7 fig, 2 tab, 17 ref.

Descriptors: \*New Hampshire, \*Freezing, \*Soil water, \*Crystall growth, \*Frost heaving, \*Cryogenics, Silts, Thermocline, Overburden, Ice, Saturated flow, Laboratory tests, Model studies, Theoretical analysis, Instrumentation, Gamma scanning system.

The flux of water and the resultant formation of discrete ice lenses were studied in samples of New Hampshire silt which were saturated and then frozen under different temperature gradients and overburden pressures. A dual energy gamma scanning system was employed to locate the position of the growing ice lens relative to the freezing front. Parameters controlling water flow and the location of the ice lenses were employed to evaluate theories that have been proposed to describe the mechanisms of ice lens formation. The capillary theory was employed to locate the freezing front. However, the ice lenses were found to be located 0.2-0.4 cm behind the freezing front, which is inconsistent with the location of the ice lenses predicted by the capillary theory. Neither the hydrodynamic theory nor the secondary frost heaving theory account for the redistribution of overburden pressure between soil particles, ice, and water. These theories cannot be employed to predict the location of the ice lens relative to the freezing front until overburden pressure effects are incorporated into the theory. (Visocky-ISWS)

W78-10919

**AN INVESTIGATION OF CREEP INSTABILITY AS A MECHANISM FOR GLACIER SURGES.**

Department of Energy, Mines and Resources, Ottawa (Ontario). Polar Continental Shelf Project.  
W. S. B. Paterson, U. Nitsan, and G. K. C. Clarke.  
Available from the National Technical Information Service, Springfield, VA 22161 as LA-UR-77-550. Price codes: A03 in paper copy, A01 in microfiche. Report LA-UR-77-550, Los Alamos Scientific Laboratory, New Mexico. 37 p, 5 fig, 5 tab, 28 ref. (1977).

Descriptors: \*Glaciers, \*Movement, \*Model studies, Stability, Ablation, Ice, Mathematical models, Heat transfer, Strain, Temperature, Mechanics, Glaciology, Creep instability, Glacier surges.

Creep instability, the runaway increase of internal temperature and deformation rate, has been suggested as a possible cause of surges of cold glaciers. This was investigated by considering a simple slab model which includes the effect of ice advection normal to the surface. Whether a steady-state solution of the heat transfer equation exists depends on the value of a 'stability parameter' proportional to the ratio of the rate of deformation heat production to the rate at which this heat is conducted away. If the parameter exceeds a certain critical value, instability occurs; and basal ice eventually reaches melting point. The ice mass can then start to slide over its bed. If the stability parameter exceeds a second higher critical value, a layer of basal ice at melting point will form. The critical values depend on geothermal heat flux and strongly on advection. Upward advection, as in the ablation area, decreases stability, whereas downward advection (accumulation) increases it. On the other hand, if unstable conditions exist, as accumulation increases the growth rate of the instability while ablation decreases it. Calculations suggest that certain natural ice masses may be unstable. The time for the instability to develop, however, is of the order of 100 to 10,000 yr, whereas the residence time of the ice in many glaciers is less than 10,000 yr. Moreover, observed periodicities of glacier surges are between 10 and 100 yr. Thus it appears that creep instability cannot explain glacier surges. (Sims-ISWS)

W78-10941

**LOW TEMPERATURE ADAPTED SUBMERSIBLE SPECTROPHOTOMETERS FOR USE IN FLOATING ICE RESEARCH.**

Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.  
For primary bibliographic entry see Field 2K.  
W78-11190

**2D. Evaporation and Transpiration****THE POTENTIAL PRIMARY PRODUCTIVITY OF PENINSULAR MALAYSIA.**

Guelph Univ. (Ontario). Dept. of Geography.  
M. R. Moss.  
Journal of Environmental Management, Vol 6, No 2, p 171-183, March 1978. 3 fig, 2 tab, 28 ref.

Descriptors: \*Evapotranspiration, \*Meteorological data, \*Primary productivity, \*Malaysian Peninsula, Environmental control, Climate, Hydrology, Planning, Ecology, Measurement, Moisture deficit, Agriculture, Land use, Equations, Mathematical models, Systems analysis.

The measurement of ecological primary productivity is an important indication of the potential agricultural productivity of a site. It is therefore particularly significant as a planning consideration in any developing area. For an evaluation of methods usable at a national scale, only 'indirect'

methods using non-vegetational data can be used to bring out spatial variations. Here, evapotranspiration data are used in the calculation of primary productivity data for the Malay Peninsula. Three available models are tested and the results compared with known 'direct' measures of primary productivity. One of these models is seen to produce results compatible with known values. Correlation with other environmental factors is then sought and a relationship between decreasing primary productivity values and increasing elevation is found to be significant. The significance of these findings in the context of existing development schemes and practices is discussed. (Bell-Cornell)

W78-10650

**EXTREME EVAPOTRANSPIRATION BY IRRIGATED ALFALFA: A CONSEQUENCE OF THE 1976 MIDWESTERN DROUGHT.**

Nebraska Univ., Lincoln. Agricultural Meteorology Section.  
N. J. Rosenberg, and S. B. Verma.  
Journal of Applied Meteorology, Volume 17, No. 7, p 934-941, July 1978. 5 fig, 3 tab, 22 ref. NSF ATM-10000 A01.

Descriptors: \*Evapotranspiration, \*Alfalfa, \*Central U.S., \*Irrigation, Irrigation wells, Irrigation water, Irrigation systems, Droughts, Lysimeters, Growth rates, Heat flow, Soils, \*Irrigated alfalfa, \*Midwestern drought, Precision weighing, Growing season, Latent heat flux, Soil heat flux density, Sensible heat advection, Net radiation.

The rate of evapotranspiration by irrigated alfalfa at Meade, Nebraska, reached record levels in 1976. Evapotranspiration was measured with precision weighing lysimeters in a field 1.9 ha in size. Evapotranspiration ranged during the growing season from 4.75 to 14.22 mm/day and exceeded 10 mm/day on 1/3 of the days studied. On each day of study, the ratio of latent heat flux density (LE) to the sum of the net radiation and soil flux densities (Rn+S) was such that LE/(Rn+S) was greater than 1, indicating the occurrence of significant sensible heat advection. On clear days during midsummer, the net radiation provided energy sufficient for evaporation of no more than 7 mm/day. Sensible heat advection provided the remaining energy consumed in evapotranspiration. The unusually strong sensible heat advection was due to the generally dry condition of surrounding regions during the drought of 1976. (Roberts-ISWS)

W78-10923

**A PORTABLE CHAMBER FOR RAPID EVAPOTRANSPIRATION MEASUREMENTS ON FIELD PLOTS.**

South Carolina Agricultural Experiment Station, Florence.  
D. C. Reicosky, and D. B. Peters.  
Agronomy Journal, Vol 69, No 4, p 729-732, July-August 1977. 4 fig, 6 ref.

Descriptors: Sampling, \*Evapotranspiration, \*Crop production, Scheduling, \*Irrigation efficiency, Soil water, Soil moisture, Temperature, Measurement.

The increased importance of water-use efficiency in agricultural production has prompted the need for new techniques to measure evapotranspiration (ET) on field plots to evaluate the effects of new soil and water management practices on plant-water use and stress. This note describes the design and performance of an inexpensive, portable chamber for rapid field measurement of ET. This chamber was constructed from aluminum conduit covered with Mylar film and mounted on a farm tractor for portability. The air within the chamber was mixed constantly with four strategically located fans. The ET rate was calculated from the air and wet-bulb temperatures of a

## Field 2—WATER CYCLE

### Group 2D—Evaporation and Transpiration

thermistor psychrometer before the chamber was lowered on the plot and 1 minute later. The psychrometer's accuracy was checked by measuring the transpiration from a solution-absorption system that accurately measured the change in solution level using an LVDT-float system. When microlimatological conditions were changing slowly, transpiration was assumed to be equal to the absorption. The high correlation between measured absorption and transpiration rates indicated reasonable accuracy. The chamber's accuracy and rapidity of the measurement, portability, and relatively low cost makes it a useful tool in measuring ET under field conditions. (Skogerboe-Colorado State)

W78-10628

### 2E. Streamflow and Runoff

**WATER DISCHARGE OF IMJA KHOLA IN KHUMBU HIMAL, Nagoya Univ. (Japan).** Water Research, Inst. For primary bibliographic entry see Field 2C. W78-10505

**OPTIMAL IDENTIFICATION OF NONLINEAR SURFACE RUNOFF SYSTEMS WITH COPOSITIVITY THRESHOLD CONSTRAINTS, Technion-Israel Inst. of Tech., Haifa (Israel).** Faculty of Industrial and Management Engineering. A. Boneh, and A. Golan. Advances in Water Resources, Vol. 1, No. 3, p 121-129, March 1978. 4 fig, 2 tab, 11 ref.

**Descriptors:** \*Runoff, \*Illinois, \*Watersheds(Basins), \*Model studies, \*Mathematical models, Precipitation(Atmospheric), Rainfall, Mathematics, Analytical techniques, Numerical analysis, Hydrology, Optimal identification, Copositivity threshold constraints.

The surface runoff system is often represented by a single-input, single-output model in which the rainfall excess  $x(t)$  is defined as the input function and the direct surface runoff  $y(t)$  is the output. The problem considered was the optimal identification of the system from given records of several independent storm events, each consisting of an input and the corresponding output function. The system was represented by a discrete-time, second-order Volterra series. The method was a point-by-point identification which can be extended to Volterra systems of order higher than a second order. The identified system was required to be conservative as in a previous work. In this study, the identified system further was required to be copositive. Therefore, the notion of copositivity was introduced, and an example of a watershed system in Southern Illinois was identified with variable copositivity threshold constraints. (Sims-ISWS)

W78-10515

**ON THE SPREADING OF POWER PLANT COOLING WATER IN A TIDAL RIVER APPLIED TO THE RIVER ELBE, Swedish Meteorological and Hydrological Inst., Norrköping.** For primary bibliographic entry see Field 5B. W78-10518

**THE PHYSIOGRAPHIC INFLUENCE ON RECESSION RUNOFF IN SMALL NORWEGIAN RIVERS, Norsk Inst. for Vannforskning, Blindern.** For primary bibliographic entry see Field 4A. W78-10528

**LOW-FLOW FREQUENCY OF GEORGIA STREAMS, Geological Survey, Doraville, GA. Water Resources Div.**

R. F. Carter, and S. A. Putnam. Water-Resources Investigations 77-127 (open-file report), January 1978. 104 p, 7 fig, 17 ref.

**Descriptors:** \*Low flow, \*Low flow frequency, \*Streamflow, \*Georgia, Streams, Base flow, Average flow, Droughts, Runoff, Data collections, Hydrologic data, Gaging stations.

Analyses of low-flow data and tabulation of computed low-flow frequency are presented for all stream sites in Georgia where suitable flow records have been collected. These include 147 continuous-record gaging stations and 102 partial-record gaging stations. Frequency records for gaging stations with short records have been adjusted where possible so as to more nearly represent results that would have been obtained from longer records. Areal variations in low-flow characteristics are indicated and the relationship of these characteristics to geology are discussed. Streamflow (per square mile of drainage area) during dry weather periods is generally greatest in the Blue Ridge province in the northern part of the State and in the upper zone of the Coastal Plain below the Fall Line. It is generally smallest in the lower zone of the Coastal Plain. Low streamflow in the Valley and Ridge and the Piedmont provinces is generally in an intermediate range. (Woodard-USGS)

W78-10623

**FLOOD PROFILES FOR LOWER BROOKER CREEK, WEST-CENTRAL FLORIDA, Geological Survey, Tallahassee, FL. Water Resources Div.** W. R. Murphy, Jr. Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 955. Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-115, March 1978. 21 p, 5 fig, 4 tab, 17 ref.

**Descriptors:** \*Flood profiles, \*Peak discharge, \*Flood recurrence interval, \*Flood plains, \*Flood plain zoning, Streamflow, Flow rates, \*Florida, \*Brooker Creek(FL), Hillsborough County, Pinellas County, Step-backwater analysis.

Flood heights are computed for a range of recurrence intervals for a 12.6 mile reach of Brooker Creek, in west-central Florida, beginning at the mouth of Lake Tarpon. A U.S. Geological Survey step-backwater computer program, E431, was used in these analyses using (1) stream and valley cross-section geometry and roughness data, (2) recurrence interval flood-peak discharges, (3) recurrence interval starting elevations, and (4) gaging station stage-discharge relations. Flood heights may be plotted versus distance above stream mouth and connected to construct flood profiles. They also may be used to indicate areas of inundation on detailed topographic maps. (Woodard-USGS)

W78-10624

**RAINFALL-RUNOFF DATA FOR SELECTED BASINS, PORTLAND, OREGON, AND VANCOUVER, WASHINGTON, 1973-77, Geological Survey, Portland, OR. Water Resources Div.** For primary bibliographic entry see Field 7C. W78-10631

**FLOOD FREQUENCY ANALYSIS WITH A GENERALIZED SKEW COEFFICIENT, Geological Survey, Reston, VA. Water Resources Div.** G. D. Tasker. Water Resources Research, Vol 14, No 2, p 373-380, April 1978. 2 fig, 1 tab, 5 ref.

**Descriptors:** \*Floods, \*Peak discharge, \*Flood frequency, \*Frequency analysis, \*Monte Carlo method, Analytical techniques, \*Regional skew coefficient.

The Hydrology Committee of the Water Resources Council (1976) has recently issued guidelines for flood frequency analyses. One aspect of these guidelines concerns the estimate of skewness. Monte Carlo experiments are used to gain some insights into sensitivity of estimates of peak flows to errors in mapped skew coefficients. The optimum factor by which to weigh a sample skew coefficient and a generalized skew coefficient is a function of sample size, population skew coefficient, and map error. (Woodard-USGS)

W78-10639

**LOW-FLOW CHARACTERISTICS OF STREAMS IN THE LOWER WISCONSIN RIVER BASIN, Geological Survey, Madison, WI. Water Resources Div.** W. A. Gebert. Water-Resources Investigations 77-118 (open-file report), March 1978. 80 p, 6 fig, 2 plates, 3 tab, 14 ref.

**Descriptors:** \*Low flow, \*Streamflow, \*Flow characteristics, \*Low-flow frequency, \*Wisconsin, Streamflow forecasting, Base flow, Analytical techniques, Regression analysis, Reliability, \*Lower Wisconsin River basin(Wisc), 7-day 10-year low flow, Flow duration.

Low-flow characteristics of streams in the lower Wisconsin River basin are presented in a series of tables. Included are estimates of low-flow frequency and flow duration at a series of tables. Included are estimates of low-flow frequency and flow duration at 11 gaging stations; low-flow frequency characteristics at 26 low-flow partial-record stations and 70 miscellaneous sites; and a list of low-flow discharge measurements at 155 miscellaneous sites. Relations are provided to estimate low-flow characteristics at ungaged sites and at sites where one base-flow discharge measurement is available. The relationships were determined from multiple regression analyses that related the low-flow characteristics at gaging stations and low-flow partial-record stations to basin characteristics. The standard error of estimate is provided for each method of estimating the annual minimum 7-day mean flow below which the flow will fall on the average of once in 2 years and once in 10 years. Standard error provides the user with the expected degree of accuracy for each method. (Woodard-USGS)

W78-10643

**CONVERGENCE OF FOUR-POINT IMPLICIT WATER WAVE MODELS, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.** V. M. Ponce, H. Indlekofer, and D. B. Simons. American Society of Civil Engineers, Journal of the Hydraulics Division, Vol. 104, No. HY7, Proceedings Paper 13890, p 947-958, July 1978. 3 fig, 11 ref, 3 append.

**Descriptors:** \*Waves(Water), \*Theoretical analysis, \*Numerical analysis, Hydraulics, \*Model studies, Unsteady flow, Continuity equation, Froude number, Stability, Methodology, Shallow water waves, Courant number, Convergence, Finite differences.

A comprehensive theoretical treatment of the convergence of the four-point implicit numerical model of shallow water waves was presented. The propagation celerity and attenuation factor of the numerical analog were derived, and convergence was tested by establishing the ratios of attenuation and translation given by the numerical and analytical solutions. Convergence was shown to be a function of the Froude number, the dimensionless

## Streamflow and Runoff—Group 2E

wave number, the Courant number, the spatial resolution, and the weighting factor of the scheme. (Singh-ISWS)  
W78-10912

**VARIED FLOW FUNCTIONS FOR CIRCULAR CHANNELS**, Newcastle-upon-Tyne. (England). Dept. of Civil Engineering.  
For primary bibliographic entry see Field 8B.  
W78-10913

**MATHEMATICAL SIMULATION OF DAM-BREAK FLOW**, Ljubljana Univ. (Yugoslavia). Dept. of Civil Engineering.  
For primary bibliographic entry see Field 8B.  
W78-10914

**CALIBRATION TECHNIQUE FOR 1-D UNSTEADY FLOW MODELS**, National Weather Service, Silver Spring, MD. Hydrologic Research Lab.  
For primary bibliographic entry see Field 8B.  
W78-10915

**FLUID ROUTING BY CHARACTERISTIC METHODS**, Lanchester Polytechnic, Coventry (England). Dept. of Civil Engineering.  
K. Sivaloganathan.  
American Society of Civil Engineers Journal of the Hydraulics Division, Vol. 104, No. HY7, Proceedings Paper 13886, p 1075-1091, July 1978. 7 fig, 4 tab, 18 ref, 2 append.

Descriptors: \*Flood routing, \*Hydraulics, \*Numerical analysis, \*Storm drains, Computers, Methodology, Channel flow, Unsteady flow, Analytical techniques, Boundary processes, Hydrographs, \*Method of characteristics, St. Venant equations.

A modified form of the rectangular grid characteristic method and the characteristic method of specified distances were detailed. Computed solutions by the two methods were compared for different types of boundary conditions. The two methods were found to yield solutions that agree closely in all situations. The characteristic method of specified distances was found to take less computing time than the rectangular grid characteristic method, while the latter method requires less storage and is easier to program. (Singh-ISWS)  
W78-10918

**LONGITUDINAL GRAIN SORTING BY CURRENT IN ALLUVIAL STREAMS**, Technical Univ. of Denmark, Lyngby.  
For primary bibliographic entry see Field 2J.  
W78-10924

**LONG-TERM SURFACE-WATER SUPPLY AND STREAMFLOW TRENDS IN THE UPPER COLORADO RIVER BASIN**, Arizona Univ., Tucson. Lab. of Tree-Ring Research.  
C. W. Stockton, and G. C. Jacoby, Jr.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-264 533. Price codes: A05 in paper copy, A01 in microfiche. Lake Powell Research Project Bulletin No. 18, Report NSF/RA-760410, March 1976. 79 p, 19 fig, 5 tab, 37 ref, 1 append.

Descriptors: \*Streamflow, \*Water supply, \*Surface waters, \*Colorado River Basin, Colorado River, \*Dendrochronology, Rivers, Runoff, Watersheds (Basins), Drainage, River basins, River flow, Water resources, Trees, Growth rates, Climatology.

The long-term annual runoff was reconstructed for 12 selected streamgage stations within the Upper Colorado River Basin. These gaged records were analyzed to determine homogeneity, streamflow trends, and periodicities, and were compared to other records within the Basin. Three long-term reconstructed hydrographs for the total annual flow at the Colorado River Compact Point were calculated and compared. Records showed that the early part of the 20th century was one of anomalously persistent high runoff from the Colorado River Basin, and that it apparently was the greatest and longest high-flow period within the last 450 years. When the results of the analysis are viewed in the context of future demand for water usage in the Upper Colorado River Basin, it is apparent that projected demand could soon outstrip the natural annual supply of surface water. This situation probably would necessitate shifts in water use priorities, with current agricultural and recreational allotments being diverted to those needed to meet energy, municipal, and industrial demands. (Sims-ISWS)  
W78-10940

**DROUGHT AND THE NIGERIAN FARMER**, Ibadan Univ. (Nigeria). Dept. of Geography.  
For primary bibliographic entry see Field 2B.  
W78-10979

**STUDY TO DETERMINE DISCHARGE AT 50-PERCENT FLOW DURATION AND ORDINARY HIGH WATER FOR STREAMS IN LOUISIANA**, Geological Survey, Baton Rouge, LA. Water Resources Div.  
B. L. Neely, Jr.  
Available from the OFSS, USGS Box 25425, Fed. Ctr. Denver CO 80225; Paper copy, \$3.50; Microfiche, \$5.00 Open-file report 78-218, April 1978. 21 p, 2 fig, 1 tab.

Descriptors: \*Flow duration, \*Streamflow, \*Estimating, \*Methodology, \*Louisiana, Gaging station, High water mark, Rainfall-runoff relationships, Drainage area, Channel morphology, Mannings equation, Roughness (Hydraulic).

Techniques are presented for estimating the discharge at 50-percent duration and 'ordinary high water' on ungaged streams in Louisiana that have drainage areas of less than 3,000 square miles. Discharge data from 91 gaging stations were used in developing the techniques. The discharge at 50-percent duration can be estimated if the drainage area size and mean annual precipitation are known. The 'ordinary high water' can be estimated if the drainage-area size, mean annual precipitation, channel cross section, channel slope, and Manning's roughness value are known. (Woodard-USGS)  
W78-11260

**FLOODS OF JUNE 4 AND 12, 1976, AT CULBERTSON, MONTANA**, Geological Survey, Helena, MT. Water Resources Div.  
M. V. Johnson.  
Open-file report 78-429, May 1978. 6 p, 1 plate, 1 tab, 6 ref.

Descriptors: \*Floods, \*Flood damage, \*Flood data, \*Peak discharge, \*Rainfall-runoff relationships, Flood recurrence interval, Streamflow, Culverts, Dam failure, Montana, \*Culbertson.

Runoff from rainfall caused flooding in the town of Culbertson, Montana, on June 4 and 12, 1976. Flood damage was mostly to business and residential structures within Culbertson. Two small drainage contributed the peak flows, which at one site exceeded 1,200 cubic feet per second per square mile of contributing area. Flow from the Missouri River tributary No 5 at Culbertson consisted of flow through a pipe-arch at the State Highway 16 crossing and flow that overtopped the

right bank of the main channel. Maximum combined pipe-arch and bypass flow for the June 12 flood was 1,30030 cubic feet per second. Flow from Diamond Creek consisted of flow through a culvert at the U.S. Highway 2 crossing west of Culbertson and flow that overtopped a road. Maximum combined culvert and bypass flow for the June 4 flood was 1,320 cubic feet per second. Failure of small dam increased the flow volume of the flood. (Woodard-USGS)  
W78-11262

**FLOOD INVESTIGATIONS IN NEVADA THROUGH 1977 WATER YEAR, PROGRESS REPORT 17**, Geological Survey, Carson City, NV. Water Resources Div.  
O. Moosburner.  
Open-file report 78-610, June 1978. 90 p, 2 fig, 5 ref, append.

Descriptors: \*Streamflow, \*Peak discharge, \*Nevada, \*Gaging stations, \*Crest-stage gages, Floods, Annual peak discharge, Planning, Highways, Data collections, Hydrologic data.

This is the seventeenth progress report on streamflow prepared by the U.S. Geological Survey in cooperation with the Nevada Highway Department. The report consists primarily of the tabulation of the annual peak stage and discharge by water year for each crest-stage gage included in the program. Also included are crest-stage gage records obtained in cooperation with other agencies, a brief resume of program activities and plans for the future, selected flood data collected since the last progress report, and a compilation of peak discharge data obtained at ungaged sites and at gaged sites operated under other programs. (Woodard-USGS)  
W78-11269

**DISCHARGE, GAGE HEIGHT, AND ELEVATION OF 100-YEAR FLOODS IN THE HUDSON RIVER BASIN**, Geological Survey, Albany, NY. Water Resources Div.  
R. J. Archer.  
Open-file report 78-332, April 1978. 5 p, 1 plate, 1 tab, 2 ref.

Descriptors: \*Flood discharge, \*Flood frequency, \*Hudson River, \*New York, Gaging stations, Streamflow, Flood stages, Frequency analysis, Statistical methods, \*Hudson River Basin.

The flood discharge that may be expected to be equaled or exceeded on the average of once in 100 years (100-year flood) was computed by the log-Pearson Type-III frequency relation for 72 stations in the Hudson River basin. These discharges and, where available, their corresponding gage height and elevation above mean sea level are presented in tabular form. A short explanation of computation methods is included. The data are to be used as part of a federally funded study of the water resources and related land resources of the Hudson River basin. (Woodard-USGS)  
W78-11271

**A SIMPLE-HARMONIC MODEL FOR DEPICTING THE ANNUAL CYCLE OF SEASONAL TEMPERATURES OF STREAMS**, Geological Survey, Lakewood, CO. Water Resources Div.  
T. D. Steele.  
Available from the OFSS, USGS Box 25425, Fed. Ctr. Printed copy, \$2.25; Microfiche, \$3.50. Open-file report 78-155, March 1978. 16 p, 4 fig, 4 tab, 21 ref.

Descriptors: \*Water temperature, \*Streams, \*Data collections, Networks, \*Simulation analysis, Statistical methods, Computer models, Analytical technique, Computer programs, \*Harmonic analysis.



## Field 2—WATER CYCLE

### Group 2E—Streamflow and Runoff

Due to economic or operational constraints, stream-temperature records cannot always be collected at all sites where information is desired or at frequencies dictated by continuous or near-continuous surveillance requirements. For streams where only periodic measurements are made during the year, and that are not appreciably affected by regulation or by thermal loading, a simple harmonic function may adequately depict the annual seasonal cycle of stream temperature at any given site. Resultant harmonic coefficients obtained from available stream-temperature records may be used in the following ways: (1) To interpolate between discrete measurements by solving the harmonic function at specified times, thereby filling in estimates of stream-temperature values; (2) to characterize areal or regional patterns of natural stream-temperature values; (3) to characterize areal or regional patterns of natural stream-temperature conditions; and (4) to detect and to assess any significant at a site brought about by streamflow regulation or basin development. Moreover, less-than-daily or sampling frequencies at a given site may give estimates of annual variation of stream temperatures that are statistically comparable to estimates obtained from a daily or continuous sampling scheme. The latter procedure may result in potential savings of resources in network operations, with negligible loss in information on annual stream-temperature variations. (Woodard-USGS) W78-11274

### 2F. Groundwater

**A PERSPECTIVE ON NUMERICAL ANALYSIS OF THE DIFFUSION EQUATION,** California Univ., Berkeley. Lawrence Berkeley Lab., and California Univ., Berkeley. Dept. of Materials Science and Mineral Engineering. T. N. Narasimhan. Advances in Water Resources, Vol. 1, No. 3, p 147-155, March 1978. 6 fig, 14 ref.

**Descriptors:** \*Groundwater movement, \*Diffusion, \*Model studies, \*Mathematical models, Flow, Groundwater, Porous media, Mass transfer, Energy transfer, Finite element analysis, Equations, Mathematics, Hydrology, Galerkin functions.

The equation of transient groundwater motion is founded on the principle of mass conservation and can be described mathematically by the diffusion equation. Recently, powerful integral formulations have been developed for numerically solving the diffusion equation under complex conditions. In the literature, it is customary to formulate the integral equations by integrating point differential equations. Instead, employed in this paper was a direct method of formulation, starting from the concepts of set and measure, the notion of partitions and the definition of set-averages. When the direct approach was applied to formulate the well-known finite element (FEM) equations, it was seen that the 'Galerkin' weighting function, which is treated mathematically as an artifact for weighting residuals, is but an appropriate spatial partition function. The logical framework of the direct approach was applied then to study the properties of 'lumped' and 'consistent' matrices arising in the use of the FEM. The lumped matrix, stemming naturally from the direct approach, seeks to conserve mass locally as well as globally, while the consistent matrix, which results only when the differential equation is integrated in a specific fashion, attempts only to preserve global mass balance. It was concluded that the direct approach is simple and complete, and, in so far as the integral formulation is concerned, there is little to be gained in starting with the differential equation. Further, in formulating integral equations, it is common practice to evaluate only the time-dependent changes in the mass content of the system and to ignore the evaluation of the mass content of the system at any given instant of time. In order to

be complete in itself, a true integral approach should evaluate both the time-dependent changes in the mass content of the system as well as the instantaneous mass content at any given time. (Sims-ISWS) W78-10517

**INTEGRODIFFERENTIAL EQUATIONS FOR SYSTEMS OF LEAKY AQUIFERS AND APPLICATIONS 3. A NUMERICAL METHOD OF UNLIMITED APPLICABILITY,** Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Investigacion en matematicas Aplicadas Sistemas. I. Herrera, and R. Yates. Water Resources Research, Vol. 13, No. 4, p 725-732, August 1977. 6 fig, 15 ref.

**Descriptors:** Aquifers, Aquifer management, \*Aquifer systems, \*Aquifer testing, Mathematics, Mathematical studies, Groundwater, \*Leaky aquifers, \*Equations.

The integrodifferential equation formulation of leaky aquifer mechanics is used to develop a numerical method of unlimited applicability based on the finite element technique. This approach reduces the dimensionality of the problem and effectively uncouples the equations corresponding to each of the aquifers. Thus the number of nodes required and the bandwidth of the matrices involved are significantly reduced. Consequently, storage and computer time are decreased by a factor greater than 30 in axially symmetric problems and by a considerably greater factor in the absence of such symmetry. (See also W74-12333 and W73-13378) (Skogerboe-Colorado State) W78-10587

**NONLINEAR DIFFUSION APPLIED TO GROUNDWATER CONTAMINATION PROBLEMS,** Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering. For primary bibliographic entry see Field 5B. W78-10606

**GROUND-WATER RESOURCES OF TANGIPAHOA AND ST. TAMMANY PARISHES, SOUTHEASTERN LOUISIANA,** Geological Survey, Baton Rouge, LA. Water Resources Div. For primary bibliographic entry see Field 4B. W78-10620

**A GROUND-WATER INVENTORY OF THE WAIALUA BASAL-WATER BODY, ISLAND OF OAHU, HAWAII,** Geological Survey, Lakewood, CO. Water Resources Div. For primary bibliographic entry see Field 4B. W78-10622

**GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1971-75,** Geological Survey, Lawrence, KA. Water Resources Div. For primary bibliographic entry see Field 7C. W78-10630

**SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--HAWAII REGION,** Geological Survey, Honolulu, HI. Water Resources Div. For primary bibliographic entry see Field 4B. W78-10635

**SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--SOURIS-RED RAINY REGION,** Geological Survey, St. Paul, MN. Water Resources Div. For primary bibliographic entry see Field 4B. W78-10636

**SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--TENNESSEE REGION,** Geological Survey, Nashville, TN. Water Resources Div. For primary bibliographic entry see Field 4B. W78-10637

**SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT LAKES REGION,** Geological Survey, Indianapolis, MO. Water Resources Div. For primary bibliographic entry see Field 4B. W78-10638

**NUMERICAL SIMULATION OF STEADY STATE THREE-DIMENSIONAL GROUND-WATER FLOW NEAR LAKES,** Geological Survey, Denver, CO. Water Resources Div. T. C. Winter. Water Resources Research, Vol. 14, No. 2, p 245-254, April 1978. 14 fig, 8 ref.

**Descriptors:** \*Groundwater movement, \*Lakes, Effects, \*Seepage, \*Surface-groundwater relationships, Model studies, Numerical analysis, Simulation analysis, Hydrogeology, Lake beds, Groundwater basins, Hydraulic models, Lake morphology, \*Three-dimensional simulation analysis, \*Lake-water budget.

Numerical simulation of three-dimensional groundwater flow near lakes shows that the continuity of the boundary encompassing the local groundwater flow system associated with a lake is the key to understanding the interaction of a lake with the groundwater system. The continuity of the boundary can be determined by the presence of a stagnation zone coinciding with the size of the lake nearest the downgradient side of the groundwater system. For most settings modeled in this study the stagnation zone underlies the lakeshore, and it generally follows its curvature. The length of the stagnation zone is controlled by the geometry of the lake's drainage basin divide on the side of the lake nearest the downgradient side of the groundwater system. In the case of lakes that lose water to the groundwater system, three-dimensional modeling also allows for estimating the area of lake bed through which outseepage takes place. Analysis of the effects of size and lateral and vertical distribution of aquifers within the groundwater system on the outseepage from lakes shows that the position of the center point of the aquifer relative to the littoral zone on the side of the lake nearest the downgradient side of the groundwater system is a critical factor. If the center point is downslope from this part of the littoral zone, the local flow system boundary tends to be weak or outseepage occurs. If the center point is upslope from this littoral zone, the stagnation zone tends to be stronger (to have a higher head in relation to lake level), and outseepage is unlikely to occur. (Woodard-USGS) W78-10642

**GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1978,** Geological Survey, Salt Lake City, UT. Water Resources Div. J. S. Gates. Utah Division of Water Resources, Salt Lake City, Div of Water Resources, Cooperative Investigations Report No 17, 1978. 63 p, 37 fig, 3 tab, 16 ref.

**Descriptors:** \*Groundwater resources, \*Utah, \*Water level fluctuations, \*Aquifer characteristics, \*Water utilization, Water quality, Withdrawal, Irrigation, Water supply, Water demand, Water wells, Water yield, Hydrogeology, Groundwater recharge, Annual, Data collections.

This report is the fifteenth in a series of annual reports that describe ground-water conditions in Utah. The estimated total withdrawal of water from wells in Utah in 1977 was about 947,000 acre-feet, which was about 86,000 acre-feet more than in 1976 and 210,000 acre-feet greater than the average annual withdrawal for the period 1967-76. Both the increases over 1976 and the increase over the 10-year average were due primarily to increases in withdrawals for irrigation and public supply. Precipitation in 1977 was below average in most of Utah, especially during the early part of the year. The decreased availability of surface water for irrigation and below-average precipitation resulted in an increase in ground-water withdrawals for irrigation. Water levels generally declined in the major areas of ground-water development. Included is a list of ground-water reports for Utah that were released by the U.S. Geological Survey during 1977. (Woodard-USGS) W78-10645

**PROBABLE YIELDS OF WELLS IN THE SAND-AND-GRAVEL AQUIFER, WISCONSIN,**  
Geological Survey, Madison, WI. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10646

**PROBABLE YIELDS OF WELLS IN THE SANDSTONE AQUIFER, WISCONSIN,**  
Geological Survey, Madison, WI. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10647

**A STUDY OF NEAR WELL GROUNDWATER FLOW AND THE IMPLICATIONS IN WELL DESIGN,**  
New South Wales Univ., Kensington (Australia). Water Research Lab.  
For primary bibliographic entry see Field 8B.  
W78-10668

**STEADY-STATE DRAWDOWNS IN COUPLED AQUIFERS,**  
Geraghty and Miller, Inc., Tampa, FL.  
L. H. Motz.  
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13886, p 1061-1074, July 1978. 8 fig, 1 tab, 14 ref.

**Descriptors:** \*Aquifers, \*Leakage, \*Drawdown, \*Mathematical models, Equations, Groundwater movement, Pumping, Steady flow, Evapotranspiration, Water resources, Water supply, Wells, Water table aquifers, Coupled aquifers.

The analytical linear solution that predicts the steady-state drawdowns for a coupled two-aquifer system in which pumping from an underlying artesian aquifer is balanced by a reduction in evapotranspiration from an overlying water-table aquifer was developed. An example illustrating how the drawdown equations can be used to determine whether significant drawdowns will occur in the water-table aquifer was presented. These drawdown equations can be used for preliminary analysis and planning studies and to test the convergence of digital model solutions when these more sophisticated techniques are warranted. A major limitation to using these equations is that the predicted water table drawdowns cannot be so great that evapotranspiration would cease altogether and, thus, could not be reduced any further to balance the pumping. (Visocky-ISWS) W78-10917

**SUBSURFACE DRAINAGE IN SOILS WITH HIGH HYDRAULIC CONDUCTIVITY LAYERS,**  
North Carolina State Univ., at Raleigh. Dept. of Biological and Agricultural Engineering.  
Y. K. Tang, and R. W. Skaggs.  
Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 3, p 515-521, May-June 1978. 16 fig, 20 ref.

**Descriptors:** \*Subsurface drains, \*Hydraulic conductivity, \*Soils, Groundwater movement, Water table aquifers, Drains, Mathematical models, Equations, Head loss, Depth, Saturated flow, Unsaturated flow, Soil water, Computer models, Drawdown.

The Richards equation for two-dimensional, saturated-unsaturated flow during drainage was solved for layered soils using finite difference methods. Solutions were obtained for soils in which the deeper layer has a higher hydraulic conductivity than the surface layer. Solutions were presented to show the distribution of equipotential lines and position of the water table during drainage processes. When the drain depth is increased so that it is closer to the high conductivity layer, head loss due to convergence near the drain is reduced. Thus, deeper drains may significantly increase drainage rates, even if the hydraulic head at the outlet remains unchanged. This effect is larger for deep profiles and narrow drain spacings than for shallow profiles and wide spacings. The effect of increasing the drain depth also increases with the hydraulic conductivity of the bottom layer. When outlet conditions are limiting, the most efficient drain depth is that of the layer interface. Solutions for various cases showed that further increasing the depth had only a slight effect on water table drawdown. (Visocky-ISWS) W78-10922

**A COMPARISON OF HYDROTHERMAL RESERVOIRS OF THE WESTERN UNITED STATES.**  
Geonomics, Inc., Berkeley, CA.  
For primary bibliographic entry see Field 4B.  
W78-10928

**THE RELIEF AND LAND FORM MAP OF AUSTRALIA: DOES IT SHOW ROCK TYPES AND LAND FORMS OF HYDROLOGIC SIGNIFICANCE,**  
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.  
For primary bibliographic entry see Field 7C.  
W78-10963

**A NUMERICAL, FIELD AND LABORATORY STUDY OF FLOW IN ROCKS WITH DEFORMABLE FRACTURES,**  
Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.  
J. E. Gale.  
Scientific Series No. 72, 1977, 145 p, 78 fig, 86 ref, 18 tab, append.

**Descriptors:** \*Rocks, \*Rock mechanics, \*Rock properties, \*Model studies, \*On-site tests, \*Laboratory tests, \*Numerical analysis, Flow, Pressure, Deformation, Stress analysis, Aquifer systems, Permeability, \*Galerkin method, \*Steady-state interaction, \*Nonuniform apertures, \*Uniform apertures, In situ measures, Axisymmetric model.

The main objectives of this study were to determine whether fractures open or close because of changes in fluid pressure and what effect such changes in fracture aperture might have on fluid pressure distributions and flow rates within the fracture system. The research program consisted of (1) numerical, (2) field and (3) laboratory studies. A numerical model is presented that simulates the steady-state interaction of fluid pressures and stresses in fractured rock masses. This simula-

tion requires the combination of two nonlinear equations and the use of two finite-element techniques, one for fluid flow in fractures and the other for stress analysis of the joined rock mass. The finite-element formulations are developed directly from the appropriate governing equations using the Galerkin method. The numerical model can simulate general two-dimensional plane strain problems in either vertical or horizontal sections as well as the axisymmetric case of flow to a well intersecting a system of horizontal fractures. Model studies with idealized fracture systems showed that fractures open during injection and close during withdrawal and that injection rates are much greater than the withdrawal rates for corresponding pressure gradients. Also, the model studies showed that because of the difference in fluid pressure distribution, fractures with nonuniform apertures cannot be replaced with a system of fractures having equivalent uniform apertures. (WATDOC) W78-11197

**AQUIFER TESTS - THE STATE OF THE ART IN HYDROLOGY,**  
Geological Survey, Lubbock TX. Water Resources Div.  
E. P. Weeks.  
In: Proceedings of the Invitational Well-Testing Symposium held in Berkeley, California, October 19-21, 1977, p 14-26, 1977. 1 fig, 1 tab, 93 ref.

**Descriptors:** \*Aquifer testing, \*Aquifer characteristics, \*Analytical techniques, \*Reviews, Evaluation, Aquifers, Transmissivity, Storage coefficient, Specific yield, Aquitards.

Careful planning and design, based on site investigation and pretest prediction, are essential in performing successful aquifer tests. The importance of identifying the geohydrologic situation during the site investigation cannot be overemphasized, because the theoretical response curves for different geohydrologic conditions tend to be similar to shape. Thus, use of the shape of the data response curve to identify the geohydrologic model applicable to the test site could be very misleading and result in erroneous conclusions. Pretest prediction, based on best estimates of the hydraulic properties of the aquifer and the adjacent confining beds, is also important for successful aquifer-test design. Such predictions can indicate the need for additional observation wells, their location, and the duration necessary for a successful test. (Woodard-USGS) W78-11257

**STRATIGRAPHIC TEST WELL, NANTUCKET ISLAND, MASSACHUSETTS,**  
Geological Survey, Reston, VA. Geologic Div.  
For primary bibliographic entry see Field 4B.  
W78-11266

**GEOHYDROLOGY OF THE GREAT BEND PRAIRIE, SOUTH-CENTRAL KANSAS,**  
Geological Survey, Lawrence, KA. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11268

**WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, SEPTEMBER 1977.**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11270

## Field 2—WATER CYCLE

### Group 2F—Groundwater

**WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1974-78.**  
Geological Survey, Lakewood, CO. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11273

**JANUARY 1978 WATER LEVELS, AND DATA RELATED TO WATER-LEVEL CHANGES SINCE 1940 OR 1950, WESTERN KANSAS.**  
Geological Survey, Garden City, KS. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11275

**GROUNDWATER DATA FOR THE SALT BASIN, EAGLE FLAT, RED LIGHT DRAW, GREEN RIVER VALLEY, AND PRESIDIO BOLSON IN WESTERNMOST TEXAS.**  
Geological Survey, Austin, TX. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11276

### 2G. Water In Soils

**INFLUENCE OF VEGETATION ON WATER REPELLENCY IN SELECTED WESTERN WISCONSIN SOILS.**  
North Dakota State Univ., Fargo.  
J. L. Richardson, and F. D. Hole.  
Soil Science Society of America Journal, Vol 42, No 3, p 465-467, May-June 1978. 2 tab, 17 ref.

**Descriptors:** \*Infiltration, \*Vegetation effects, \*Soil property, \*Wisconsin, Laboratory tests, Soils, Forest soils, Coniferous forests, Deciduous forests, Prairie soils, Humus, Organic matter, Organic soils, Fungi, Soil fungi, Vegetation, Effects, Wetting, Surface tension, Soil science, Water repellency, Wetting angle.

Water repellency in several western Wisconsin soils was characterized by three tests: wetting angle ( $\theta$ ), wetting drop penetration-time (WDPT), and 90 deg surface tension ( $\gamma_{sub}$ ) etc. It appears that the high contents of organic matter in the A horizon of Mollisols and Alfisols are associated with slight repellency as measured by  $\theta$  and WDPT. Frequent burning of a prairie on a Mollisol increased persistence (WDPT) and  $\gamma_{sub}$  etc, as compared with soil at a nearby control site, but had no influence on  $\theta$ , indicating that repellency is present at initial water contact but is unstable and disappears with prolonged water contact. More litter layers having observable fungal mycelia had repellent surfaces as measured by three of the above tests. These repellent materials were observed in Spodosols under red pine, hemlock, and under a mixed hard and soft wood stand with dense ericaceous shrub understorey. The repellency of mor horizons of Spodosols may relate in some significant way to process of genesis of Spodic horizon. (Sims-ISWS)  
W78-10520

**A PHYSICALLY-BASED MODEL TO PREDICT RUNOFF UNDER VARIABLE RAIN INTENSITY.**  
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.  
A. Y. Hachum, and J. F. Alfaro.  
Transactions of the American Society of Agricultural Engineering, Vol 21, No 3, p 500-509, May-June 1978. 2 fig, 2 tab, 14 ref.

**Descriptors:** \*Infiltration, \*Rainfall, \*Model studies, Mathematical models, Irrigation, Hydraulic conductivity, Soils, Soil water, Ponding, Rainfall intensity, Precipitation (Atmospheric), Precipitation intensity, Soil properties, Soil science.

Physically-based rain infiltration models are useful in predicting time and amount of potential runoff. A simple physical model for describing infiltration in uniform soils under variable rainfall was presented. The model was tested against others, and a close agreement was found. Model applications also were included. (Sims-ISWS)  
W78-10525

**PREDICTED AND MEASURED DRAINABLE POROSITIES FOR FIELD SOILS.**  
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.  
R. W. Skaggs, L. G. Wells, and S. R. Ghatge.  
Transactions of the American Society of Agricultural Engineering, Vol 21, No 3, p 522-528, May-June 1978. 8 fig, 3 tab, 12 ref.

**Descriptors:** \*Porosity, \*Soil properties, \*Drainage, \*Model studies, Mathematical models, Laboratory tests, Soil water movement, Soil water, Soils, Water table, Hydraulic conductivity, Soil science, \*Drainable porosities.

Experiments were conducted on large field cores to determine the relationship between drainage volume and water table depth for five soils. The measured drainage volumes were less than predicted from the soil water characteristics for three soils, but were in good agreement for the other two. Drainable porosities were calculated from both theoretical and experimental drainage volume-water table depth relationships by assuming that the unsaturated zone is essentially 'drained to equilibrium' with the water table. The experimental drainable porosities thus obtained were less than predicted. Drainable porosities for drainage in two-dimensions were calculated from experimental results for one dimension by assuming an elliptical water table profile. These results gave nearly constant drainable porosities for the layered soils and a variable drainable porosity for Wagram, a homogeneous, sandy soil. (Sims-ISWS)  
W78-10526

**SOIL NITRATE-NITROGEN DETERMINED BY CORING AND SOLUTION EXTRACTION TECHNIQUES.**  
Agricultural Research Service, Lafayette, IN.  
E. E. Alberts, R. E. Burwell, and G. E. Schuman.  
Soil Science Society of America Journal, Vol 41, No 1, p 90-92, January-February 1977. 1 fig, 1 tab, 13 ref.

**Descriptors:** \*Nitrates, \*Nitrogen, Sampling, Soil profiles, \*Soil tests, Iowa, \*Leaching, Soil chemistry.

Soil-coring and solution-extraction sampling techniques were compared for determining the content of  $N_3(-)N$  in the soil profile of a Monona silt loam in southwestern Iowa. The  $N_3(-)N$  content of the 3.05-m profile, determined by solution extraction, was 28% lower in 1972, 8% higher in 1973, and 13% lower in 1974 than that determined by soil coring. The profile difference in  $N_3(-)N$  content between the two sampling techniques was insignificant in 1973 and 1974 but was highly significant (1%) in 1972. (Skogerboe-Colorado State)  
W78-10592

**OBSERVED AND PREDICTED RATES OF PHOSPHORUS DIFFUSION IN SOILS OF VARYING BULK DENSITY AND WATER CONTENT.**  
Punjab Agricultural Univ., Ludhiana (India). Dept. of Soils.  
G. S. Hira, and N. T. Singh.  
Soil Science Society of America Journal, Vol 41, No 3, p 537-540, May-June 1977. 5 fig, 2 tab, 14 ref.

**Descriptors:** \*Phosphorus, Soils, Soil chemistry, Soil investigations, Soil water, Soil moisture, \*Bulk density, \*Adsorption, \*Diffusion.

The self-diffusion coefficient of phosphorus (D) was measured at bulk densities of 1.25, 1.45, 1.60 and 1.75 g/cm<sup>3</sup> and at three levels of soil water content in Choa sandy loam and Haibowal silty clay loam. The tortuosity factor was calculated from the self-diffusion coefficient of <sup>36</sup>Cl. Appropriate values of the adsorption isotherm and the tortuosity factor were used to predict P diffusion coefficient in both soils. The tortuosity factor increased with increase in soil bulk density and increase in water content from 7 to 18% in the Choa soil and 14 to 25% in the Haibowal soil. As bulk density increased from 1.25 to 1.60 g/cm<sup>3</sup>, the observed diffusion coefficient values averaged over all water contents, increased from 0.05 x 10<sup>-10</sup> to 0.31 x 10<sup>-10</sup> and 2.13 x 10<sup>-10</sup> to 5.07 x 10<sup>-10</sup> cm<sup>2</sup>/sec in Choa and Haibowal soils, respectively. Further increase in bulk density to 1.75 g/cm<sup>3</sup> decreased the diffusion coefficient of P in both soils to a greater extent than at low bulk density. The phosphate ion-soil particle interaction was minimum at a soil bulk density of 1.60 g/cm<sup>3</sup>. (Skogerboe-Colorado State)  
W78-10593

**STABILIZATION OF CALCIUM BY SURFACE CHARGE VARIATION IN AN OXISOL.**  
California Univ., Davis. Dept. of Soils and Plant Nutrition.  
D. N. Munns, and R. L. Fox.  
Soil Science Society of America Journal, Vol 41, No 4, p 682-685, July-August 1977. 3 fig, 24 ref.

**Descriptors:** \*Calcium, Soils, Soil investigations, Soil chemistry, Soil water, Soil moisture, \*Cation exchange, Salts, \*Anion exchange, \*Oxisol.

In the surface layer of a Ca-deficient, fine-textured Hawaiian Oxisol, concentrations of Ca in solution were poised against tendencies to increase with liming in the pH-range 5-6, and to decrease with dilution in the range of water content 0.35 to 2.0. Effects of lime and water content on the distribution of Ca between solid phase and solution were quantitatively consistent with effects of pH and ionic strength on exchange capacity. Relationships between soil pH and ionic strength on exchange capacity. Relationships between soil pH, cation exchange capacity, and dissolved Ca were determined in soil samples taken from a field-liming trial. Effects of ionic strength on exchange capacity were determined by summation of adsorbed metal cations after equilibration of soil samples in different salt solutions. Effects of water content on cations in solution were determined by analysis of solutions centrifugally extracted at various water contents. (Skogerboe-Colorado State)  
W78-10594

**AN ALKALINE OXIDATION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN SOILS.**  
Iowa State Univ., Ames. Dept. of Agronomy.  
W. A. Dick, and M. A. Tabatabai.  
Soil Science Society of America Journal, Vol 41, No 3, p 511-514, May-June 1977. 7 tab, 13 ref.

**Descriptors:** \*Phosphorus, Soils, \*Soil investigations, Nutrients, Fertilizers, Fertilization, Sediments, \*Lake sediments.

A simple and precise method for determination of total phosphorus in soils and lake sediments is described. A mixture of soil and sodium hypobromite solution is boiled to dryness in a sand bath (260-280°C), and the total amount of orthophosphate is extracted with 1N H<sub>2</sub>SO<sub>4</sub> and determined colorimetrically by the molybdenum blue method. Analysis of a group of diverse soil, lake sediment, and sewage sludge samples indicated that the proposed method and the HClO<sub>4</sub> digestion method give essentially the same total P values. With 10 soils, the average results by the proposed NaOBr oxidation method were 1% higher than those obtained by the HClO<sub>4</sub> digestion



method and 4% lower than those obtained by the Na<sub>2</sub>CO<sub>3</sub> fusion method. A comparison of methods used for colorimetric determination of the orthophosphate extracted indicated that the results by the recently developed method by Dick and Tabatabai agree closely with those obtained by the method of Murphy and Riley. Digestion of samples with sodium hypobromite solution and colorimetric determination of the extracted P by the method of Murphy and Riley. Digestion of samples with sodium hypobromite solution and colorimetric determination of the extracted P by the method of Murphy and Riley permits rapid analysis of a large number of samples at one time. (Skogerboe-Colorado State)  
W78-10596

**DECOMPOSITION OF RICE STRAW IN SOILS AS AFFECTED BY SOME MANAGEMENT FACTORS**, California Univ., Davis. Dept. of Land, Air, and Water.  
P. Sain, and F. E. Broadbent.  
Journal of Environmental Quality, Vol 6, No 1, p 96-100, January-March 1977. 6 fig, 3 tab, 18 ref.

Descriptors: \*Rice, \*Decomposing organic matter, Soils, \*Soil investigations, Laboratory tests, Nitrogen, Phosphorus, Soil properties, Sulfur.

Decomposition of Rice straw contained in nylon bags was measured in field experiments at two different locations during winter and spring months. Incorporated straw decomposed more rapidly than did straw on the soil surface, and least decomposition occurred in straw samples suspended above the soil surface as in a windrow. Decomposition rates were not affected by chopping straw. Laboratory decomposition experiments conducted at 8 and 25°C and at 60 and 150% water holding capacity showed more effect of low temperature in retarding straw decomposition than excess water. Additional nitrogen stimulated straw decomposition in Stockton adobe clay during the first few weeks but had little effect in Sacramento clay. After 2 months' initial decomposition the soil samples treated with straw were dried and rewetted to 60% water holding capacity (WHC), then incubated another 2 months. During this period straw decomposition in Sacramento clay samples which had received additional N was significantly depressed. Additional P and S had no effect on rice straw decomposition. (Skogerboe-Colorado State)  
W78-10597

**ASSESSING TWO DIAGNOSTIC METHODS FOR ENUMERATION OF NITRATE REDUCING AND DENITRIFYING BACTERIA IN SOIL-PLANT ROOT ASSOCIATIONS**, Connecticut Agricultural Experiment Station, New Haven.  
M. G. Volz.  
Soil Science Society of America Journal, Vol 41, No 2, p 337-340, March-April 1977. 4 tab, 14 ref.

Descriptors: \*Nitrates, \*Denitrification, Bacteria, Soils, Soil investigations, Soil chemistry, Fertilizers, Fertilization, Tomatoes, Soybeans, Corn(Field), \*Denitrifying bacteria.

Most probable number (MPN) determinations were made of NO<sub>3</sub>(-) reducing- and denitrifying bacteria in soil samples taken at time of crop harvest from fallow sites and from root zones of fertilized field plots of tomato, soybean or corn plants cultivated in pure stand or in association with nutsedge, a competitive weed. Diagnostic methods utilized were inoculated Difco NO<sub>3</sub>(-) broth and Giltay's medium (citrate-nitrate-asparagine + mineral salts), incubated with and without the exclusion of atmospheric O<sub>2</sub>, respectively. The NO<sub>3</sub>(-) broth method usually yielded both numerically larger and significantly different (5% level) MPNs for NO<sub>3</sub>(-) reducers (5 of 7 cases larger, 3 significant) and denitrifiers (6 of 7 cases

larger, 3 significant) from a given soil inoculum when compared with identical enumerations performed with Giltay's medium. (Skogerboe-Colorado State)  
W78-10599

**RELATIONSHIPS BETWEEN SOIL UREASE ACTIVITY AND OTHER SOIL PROPERTIES**, Iowa State Univ., Ames. Dept. of Agronomy.  
M. I. Zantua, L. C. Dumenil, and J. M. Bremner.  
Soil Science Society of America Journal, Vol. 41, No. 2, p 350-352, March-April 1977. 3 tab, 14 ref.

Descriptors: Iowa, Soils, \*Soil investigations, Soil properties, Cation exchange, Soil texture, \*Organic matter, \*Urease activity.

Surface samples of 21 diverse Iowa soils representing a wide range in pH, texture, and organic matter content were studied to determine the relationships between soil urease activity and other soil properties. Simple correlation analyses showed that urease activity was correlated very highly significantly with organic C ( $r=0.72$  at the 0.1% level), total N ( $r=0.71$  at the 0.1% level), and cation-exchange capacity ( $r=0.67$  at the 0.1% level). Urease activity also was significantly correlated with clay (0.53 at the 5% level), sand (-0.47 at the 5% level), and surface area (0.45 at the 5% level), but was not significantly correlated with pH, silt, or CaCO<sub>3</sub> equivalent. Multiple regression analyses showed that organic matter content accounted for most of the variation in urease activity. (Skogerboe-Colorado State)  
W78-10600

**IMMOBILIZATION OF FERTILIZER NITRATE APPLIED TO A SWELLING CLAY SOIL IN THE FIELD**, Texas Agricultural Experiment Station, Temple.  
D. E. Kissel, S. J. Smith, W. L. Hargrove, and D. W. Dillow.  
Soil Science Society of America Journal, Vol. 41, No. 2, p 346-349, March-April 1977. 2 fig, 1 tab, 18 ref.

Descriptors: \*Nitrates, \*Fertilizers, Fertilization, Nutrients, \*Crop production, Soil properties, Soil texture, Crop response, Immobilization, Sorghum, \*Clays, \*Nitrogen, Soil temperature.

Low recoveries of N fertilizer by crops on Houston Black clay prompted this investigation. Objectives were to determine how much fertilizer nitrate can be biologically immobilized under field conditions when fertilization exceeds crop requirements and to determine when immobilization occurs during the growing season. Calcium nitrate tagged with 9.6 atom % <sup>15</sup>N was applied to field microplots at 328 kg N/ha and grain sorghum was planted in rows across each microplot. The various components of the N balance were measured by sampling microplots at different times during the season. Only 2.1 kg N/ha was immobilized during the first 47 days after fertilization and planting. The rate of immobilization increased rapidly during the next 60 days and an additional 60 kg N/ha was immobilized. This increase was apparently in response to an increase in soil temperature above 22°C. (Skogerboe-Colorado State)  
W78-10607

**ON THE CHEMICAL FOUNDATION OF THE SODIUM ADSORPTION RATIO**, California Univ., Riverside. Dept. of Soil and Environmental Sciences.  
G. Sposito, and S. V. Mattigod.  
Soil Science Society of America Journal, Vol. 41, No. 2, p 323-329, March-April 1977. 1 fig, 2 tab, 48 ref.

Descriptors: \*Sodium, \*Cation exchange, Calcium, Magnesium, Cations, Soil chemistry, Soil investigations, Soil properties, Computer programs, Soil tests, \*Adsorption.

The theoretical chemical basis of the sodium adsorption ratio (SAR) was examined in order to clarify two important issues that arise in connection with the problem of estimating potential sodium hazard: (1) the relation between SAR and the theory of cation exchange, and (2) the implications of the universal practice of replacing SAR by what may be termed the practical SAR, which employs total concentrations of Na, Ca, and Mg instead of their free cationic concentrations. In regard to (1), it was confirmed that SAR can be given a chemical basis in terms of the Gapon cation exchange equilibrium constant which is provided in this paper with a rigorous derivation for the first time. The Gapon constant is shown to differ from the Vanselow exchange constant only because of the (arbitrary) convention adopted as to what entity is termed the ligand in the cation exchange reaction. In regard to (2), it was shown through a direct calculation of SAR and the practical SAR for 161 different soil solutions or water extracts, utilizing a comprehensive chemical equilibrium computer program, that an exact functional relationship between the two parameters does not exist. (Skogerboe-Colorado State)  
W78-10608

**PHOSPHORUS SORPTION CHARACTERISTICS OF FLOODED SOILS**, Louisiana State Univ., Baton Rouge. Center for Wetland Resources.  
R. A. Khalid, W. H. Patrick, Jr., and R. D. Delaune.  
Soil Science Society of America Journal, Vol. 41, No. 2, p 305-310, March-April, 1977. 4 fig, 3 tab, 29 ref.

Descriptors: \*Phosphorus, Soils, Soil investigations, Soil properties, \*Rice, \*Crop production, Louisiana, \*Sorption, \*Flooded soils.

Surface soils representing Alfisols and Inceptisols were collected from various parts of Louisiana under rice cultivation and incubated under oxidized (aerobic) and reduced (anaerobic) conditions for 2 weeks in a soil to 0.01M CaCl<sub>2</sub> solution ratio of 1:5. The release of native soil P and the sorption of added inorganic P was investigated under these conditions. The soils selected for study were characterized for clay content, total carbon, extractable P, pH, and oxalate-extractable Fe, soil properties associated with P sorption. The results show that generally more soil P was released under reduced than oxidized conditions, and this increase in soluble P under reduced conditions was significantly related to Bray no. 2 extractable P, clay content, and oxalate Fe. (Skogerboe-Colorado State)  
W78-10610

**ION EXCHANGE REACTIONS IN NONDRIED CHAMBERS MONTMORILLONITE HYDROXY-ALUMINUM COMPLEXES**, Minnesota Univ., St. Paul. Dept. of Soil Science.  
R. Keren, R. G. Gast, and R. I. Barnhisel.  
Soil Science Society of America Journal, Vol 41, No 1, p 34-39, January-February 1977. 1 fig, 3 tab, 30 ref.

Descriptors: Soils, \*Soil chemistry, Soil properties, Soil investigations, \*Montmorillonite, Clays, Sodium, \*Adsorption, \*Cation exchange, \*Ion exchange.

The extent and mechanisms by which hydroxy-Al interlayers may reduce the CEC of Chambers montmorillonite were studied using 22-Na labeled clay. Clay-hydroxy-Al complexes were formed by added AlCl<sub>3</sub> and NaOH at pH 7.5-9.5. AlCl<sub>3</sub> was added at 4, 8, or 16 meq/g clay and either before, after, or simultaneously with NaOH. Addition of 16 meq AlCl<sub>3</sub>/g clay followed by NaOH resulted in CEC reductions of 60, 40, and 10% at pH 7.5, 8.5, and 9.5 as measured by Na adsorption. However, there was no trapped or nonexchangeable 22-Na observed in any of the systems. Since the

## Field 2—WATER CYCLE

### Group 2G—Water In Soils

charge on the hydroxy-Al is negligible at these pH's, the CEC reduction is apparently due to trapped Al. (Skogerboe-Colorado State) W78-10611

**EVALUATION OF SOIL NITROGEN MINERALIZATION POTENTIALS UNDER MODIFIED FIELD CONDITIONS**, Agricultural Research Service, Durant, OK. Water Quality Management Lab. S. J. Smith, L. B. Young, and G. E. Miller. Soil Science Society of America Journal, Vol. 41, No. 1, p 74-76, January-February 1977. 1 fig, 3 tab, 11 ref.

Descriptors: \*Nitrogen, Soils, Soil investigations, \*Mineralization, Oklahoma, Soil temperature, \*Soil water, Soil moisture.

Amounts of mineral N obtained by a calculation procedure and measurement in fallow plots were compared during two cropping seasons and annually with eight Oklahoma soils. The calculation procedure involved adjusting the N mineralization potentials for varying soil temperature and water content. The field N measurements involved the use of soil in plastic bags and glass filter tubes. Cropping season and annual field amounts for the eight soils, on the average, ranged from 54 to 78 ppm N. In general, the calculated amounts compared favorably to the field amounts, differences frequently being <10 ppm N. Calculated amounts correlated as well or better with the field amounts than a variety of other N availability indexes. (Skogerboe-Colorado State) W78-10613

**EFFECT OF REDOX POTENTIAL AND PH ON THE UPTAKE OF CADMIUM AND LEAD BY RICE PLANTS**, Louisiana State Univ., Baton Rouge. Dept. of Agronomy. For primary bibliographic entry see Field 2K. W78-10614

**PHYSICAL PROPERTIES OF FLY ASH-AMENDED SOILS**, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. A. C. Chang, L. J. Lund, A. L. Page, and J. E. Warneke. Journal of Environmental Quality, Vol. 6, No. 3, p 267-270, July-September 1977. 2 fig, 7 tab, 9 ref.

Descriptors: \*Fly ash, Soils, Soil investigations, Soil properties, \*Soil physical properties, Soil amendments, Soil water, \*Bulk density, \*Hydraulic conductivity, Water capacity.

Fly ash from a coal-fired power generating plant was mixed with five California soils at rates of 0, 2.5, 5.0, 10.0, 25.0, and 50.0% by volume. The physical properties related to the agronomic use of fly ash-amended soils were characterized by determining water-holding capacity, bulk density, hydraulic conductivity, and modulus of rupture on laboratory compacted soil cores. The moisture release characteristics of each mixture were also determined. Results indicated that a small amount of fly ash added to soils does appear to affect some measured physical properties of soils. At application rates >25%, there was a consistent increase in water-holding capacity (except a Domino loam soil), and a decrease in bulk density and modulus of rupture in all soils tested. The hydraulic conductivity increased with small amounts of fly ash, but declined rapidly as fly ash volume increased. Although fly ash application increased the water-holding capacity of soils, the amount of water available to the plant did not change significantly. At a low application rate, fly ash amendment appeared useful in improving certain agronomic properties of soils. (Skogerboe-Colorado State) W78-10615

**EFFECT OF INORGANIC AND ORGANIC COMPOUNDS ON THE EXTRACTABILITY OF 239PU FROM AN ARTIFICIALLY CONTAMINATED SOIL**, California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology. H. Nishita, R. M. Haug, and T. Rutherford. Journal of Environmental Quality, Vol. 6, No. 4, p 451-455, October-December, 1977. 1 fig, 4 tab, 32 ref.

Descriptors: Soils, Soil investigations, \*Organic matter, Soil tests, Soil properties, Soil chemistry, \*Organic compounds, \*Inorganic compounds, Hydrogen ion concentrations, Plutonium radioisotopes.

The effect of a number of inorganic and organic compounds on the extractability of 239Pu from a contaminated soil has been examined. This has been done on an artificially contaminated kaolinitic soil by using the equilibrium batch method of extraction. Among the 21 inorganic compounds examined, NaHPO4 showed the least 239Pu extractability (0.07% of dose) and Na4P2O7 showed the greatest extractability (28.59% of dose). The compounds that showed relatively high 239Pu extractability included NaF, Na2B4O7, Na4P2O7, Na2CO3, Na2O2, NaOH, and NH4OH. Among the organic compounds, the order of 239Pu extractability was Na acetate less than Na formate less than Na oxalate less than Na tartrate less than Na citrate. A 0.004M DTPA solution was a more effective extractant than a 0.08M citric acid solution. Aside from the chemical nature of these compounds, the 239Pu extractability was influenced by soil and extractant pH, soil organic matter, equilibrium time, soil weight/extractant volume ratio, and wet-dry pretreatment of the soil (Skogerboe-Colorado State) W78-10616

**THE ASSESSMENT OF PLANT-AVAILABLE CADMIUM IN SOILS**, Wye Coll., Ashford (England). Dept. of Physical Sciences. C. Symeonides, and S. G. McRae. Journal of Environmental Quality, Vol. 6, No. 2, p 120-123, April-June 1977. 2 fig, 4 tab, 35 ref.

Descriptors: \*Cadmium, Heavy metals, Soils, Soil investigations, Water quality, Pollution, Crop response, \*Toxicity, Water pollution sources, Pollutant identification.

A study has been made of the amounts of cadmium recovered by a variety of reagents and extraction procedures from soils to which Cd has been added. Correlation of these results with the Cd content of radish plants grown in these soils has shown that the most sensitive of several possible indices to Cd uptake by plants is the amount extracted by a 1-hour shaking with 1N ammonium nitrate solution at a soil/solution ratio of 1:10 (wt/vol). The greater efficiency of this extractant compared with other proposed extractants is ascribed to the system reflecting the natural pH of the soil which has marked effect on cadmium availability to plants. (Skogerboe-Colorado State) W78-10617

**METHODOLOGY AND EMPIRICAL ESTIMATES OF THE RESPONSE FUNCTION OF SORGHUM TO IRRIGATION AND SOIL MOISTURE**, Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soil and Water. For primary bibliographic entry see Field 3F. W78-10659

**WATER REDISTRIBUTION IN PARTIALLY FROZEN, SATURATED SILT UNDER SEVERAL TEMPERATURE GRADIENTS AND OVERBURDEN LOADS**, Guelph Univ. (Ontario). Dept. of Land Resources Science.

For primary bibliographic entry see Field 2C. W78-10919

**APPROXIMATE ANALYTICAL SOLUTION FOR SOLUTE FLOW DURING INFILTRATION AND REDISTRIBUTION**, New Mexico State Univ., University Park. Dept. of Agronomy. F. De Smedt, and P. J. Wierenga. Soil Science Society of America Journal, Vol. 42, No. 3, p 407-412, May-June 1978. 5 fig, 25 ref.

Descriptors: \*Solutes, \*Soils, \*Infiltration, \*Mathematical models, Dispersion, Theoretical analysis, Equations, Pore water, Velocity, Numerical analysis, Chlorides, Hydraulic conductivity, Depth, Analytical solutions, Miscible displacement, Solute flow, Redistribution.

An approximate analytical solution was developed to describe solute flow in soil during infiltration and redistribution. For the solution it was assumed that hydrodynamic dispersion is linearly related to the pore water velocity. In order to use the solution, it is necessary to estimate the solute penetration depth. Methods of estimating the solute penetration were discussed. Solute concentration distributions computed with the approximate analytical solution were compared with those obtained with a numerical model. It was shown that the solution proposed is most useful during the infiltration phase. During the redistribution phase, the approximate analytical solution provides a first-order estimate of the solute distribution with time and depth. Computed chloride distributions compared favorably with chloride concentrations previously observed. (Visocky-ISWS) W78-10920

**A TWO-ELEMENT CERAMIC SENSOR FOR MATRIC POTENTIAL AND SALINITY MEASUREMENTS**, Forest Service (USDA), Albuquerque, NM. Rocky Mountain Forest and Range Experimental Station. D. G. Scholl. Soil Science Society of America Journal, Vol. 42, No. 3, p 429-432, May-June 1978. 4 fig, 6 ref.

Descriptors: \*Soil moisture meters, \*Saline soils, \*Salinity, \*Soil moisture, Soil water, moisture content, Moisture meters, Instrumentation, Available water, Coal mine wastes, Strip mine wastes, Water pollution sources, Land reclamation, Water quality, Moisture, Water pollution, \*Salinity sensor, \*Soil moisture sensor, \*Coal-mine spoil, \*Salinity meter, \*Matric potential sensors, Ceramic sensor, Potential measurements, Salinity measurements, Mine spoil reclamation.

A two-element ceramic sensor was developed to produce optimum electrical response to both soil water matric potential and salinity. A spring-loaded housing was developed for the elements for either drill-hole or pit-face placement. The sensors were calibrated under various matric potential, salinity, and temperature conditions. An initial field test with 72 sensors was conducted under irrigated coal mine spoil conditions. Laboratory and field results indicated reasonable instrument precision over a wide range of matric potential and salinity. The correlation between sensor output and water content in the field was best where the mean of several sensors was used. (Henley-ISWS) W78-10921

**SUBSURFACE DRAINAGE IN SOILS WITH HIGH HYDRAULIC CONDUCTIVITY LAYERS**, North Carolina State Univ., at Raleigh. Dept. of Biological and Agricultural Engineering. For primary bibliographic entry see Field 2F. W78-10922



## WATER CYCLE—Field 2

### Water In Soils—Group 2G

#### EXTRACTION AND INJECTION OF SOIL WATER WITH HOLLOW-FIBER SEMIPERMEABLE MEMBRANES

Oak Ridge National Lab., TN.  
C. Guzman, S. R. Bloxom, and G. L. MacWilliam.  
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL/MIT-217. Price codes: A03 in paper copy, A01 in microfiche. Report ORNL/MIT-217, October 21, 1975. 39 p, 8 fig, 1 tab, 6 ref, 1 append.

**Descriptors:** \*Soil water, \*Sampling, \*Membranes, Cellulose, Model studies, Mathematical models, Computer models, Computer programs, Permeability, Plastics, Semipermeable membranes, Flow, \*Hollow-fiber membranes, Soil water extraction, Soil water injection.

A non-destructive technique for periodic soil-water sampling was evaluated. The procedure was described as follows: bundles of hollow cellulose acetate fibers are embedded in the soil, vacuum is applied to the exposed end of the bundle, and water is withdrawn. The flow process through the fiber-soil system consists of three process steps: (1) the flow through the porous soil, (2) the permeation through the membrane, and (3) the flow in the hollow membrane tube. An analysis of the process steps was performed with equations in the form of the general transport equation; expressions for the resistances to the flow were obtained. A theoretical flow model for single phase flow through the system was developed. Total pressure drops and flow were measured experimentally to test the single-phase model. A two-phase model for the system also was developed. Cellulose acetate fibers were found unsuitable for use in extraction of soil water. In the absence of suitable fibers, it was not possible to evaluate the validity of the models. Alternative fibers and experimental techniques to evaluate the models were recommended. (Sims-ISWS)  
W78-10939

#### NITRIFICATION IN THREE SOILS AMENDED WITH ZINC SULFATE

Georgia Univ., Experiment. Dept. of Agronomy.  
For primary bibliographic entry see Field 2K.  
W78-11029

#### STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS—I. DISTRIBUTION OF IMMOBILIZED NITROGEN AMONGST SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY

Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.  
For primary bibliographic entry see Field 2K.  
W78-11032

#### STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS—II. MINERALIZATION OF IMMOBILIZED NITROGEN FROM SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY

Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.  
For primary bibliographic entry see Field 2K.  
W78-11033

#### EFFECT OF SOIL MOISTURE ON THE RELEASE OF ORGANIC CARBON FROM WHEAT ROOTS

Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.  
J. K. Martin.  
Soil Biology and Biochemistry, Vol 9, No 4, p 303-304, 1977. 1 tab, 6 ref.

**Descriptors:** Soil water, \*Soil moisture, \*Carbon, \*Wheat, \*Root systems, Crop response, \*Organic compounds.

A strong influence of soil moisture on the release of <sup>14</sup>C-labelled organic material into soil from cereal roots was shown by Barber and Martin (1976). There was a four-fold reduction of <sup>14</sup>C-labelled water-soluble organic C in soil from pots regularly leached with distilled water compared with soil from pots which had no water addition, other than an initial wetting of the soil to 16% by weight with nutrient solution. Leaching also affected the composition of the water-soluble material. It was not possible to determine from these experiments the relationship between the soil water content and C release from the roots. Results are presented for the release of organic C from wheat roots grown at three different soil water content. (Skogerboe-Colorado State)  
W78-11034

#### SOIL MICROBIAL AND BIOCHEMICAL CHARACTERISTICS IN RELATION TO SOIL MANAGEMENT AND FERTILITY

Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.  
W. Verstraete, and J. P. Voets.  
Soils Biology and Biochemistry, Vol 9, No 4, p 253-258, 1977. 5 tab, 18 ref.

**Descriptors:** Soil investigations, \*Fertilization, Nutrients, Fertilizers, Soil properties, \*Soil chemistry, \*Crop response, Mineralization, Organic matter, Sugar beets, \*Soil microbiology.

From 1969 to 1974, two experimental fields were studied in terms of their soil microbial and biochemical characteristics in relation to soil management practice and crop yields. Of the various microbial and biochemical properties measured soil phosphatase, saccharase, Beta-glucosidase and urease activities, N mineralization and soil respiration were found valuable to characterize the soils. These characteristics increased with increasing soil organic matter, clay and CaCO<sub>3</sub> content. They also revealed a strong effect of organic fertilization. Multiple regression analyses indicated that the alkalinity and the humus content of the soil largely determined the magnitude of these characteristics. The regression analyses also showed that the yields of winter wheat were related positively to phosphatase activity while the sugarbeet yields were related negatively to soil urease activity. (Skogerboe-Colorado State)  
W78-11035

#### SULFUR OXIDATION AND RESPIRATION IN 54-YEAR-OLD SOIL SAMPLES

Pacific Northwest Forest and Range Experiment Station, Corvallis, OR. Forestry Sciences Lab.  
For primary bibliographic entry see Field 2K.  
W78-11036

#### PHOSPHATASES IN SOILS

Iowa State Univ., Ames. Dept. of Agronomy.  
For primary bibliographic entry see Field 2K.  
W78-11037

#### EFFECT OF BIURET CONTENT ON TRANSFORMATION OF UREA NITROGEN IN SOIL

Indian Agricultural Research Inst., New Delhi Div. of Agricultural Chemicals.  
For primary bibliographic entry see Field 2K.  
W78-11038

#### ACETYLENE INHIBITION OF NITROUS OXIDE REDUCTION AND MEASUREMENT OF DENITRIFICATION AND NITROGEN FIXATION IN SOIL

Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Microbiology.  
T. Yoshinari, R. Hynes, and R. Knowles.  
Soil Biology and Biochemistry, Vol 9, No 3, p 177-183, 1977. 9 fig, 1 tab, 23 ref.

**Descriptors:** \*Denitrification, \*Nitrogen, Nutrients, \*Soil moisture, Soil chemistry, Soils, Soil investigations, \*Oxides, \*Nitrous oxide.

Reduction of N<sub>2</sub>O in moist soil was inhibited completely by 10(-2) atm C<sub>2</sub>H<sub>2</sub> and partially by 10(-5) atm C<sub>2</sub>H<sub>2</sub>. The effect of C<sub>2</sub>H<sub>4</sub> was 10 to the 4th power times less than that of C<sub>2</sub>H<sub>2</sub>. Denitrification of N<sub>2</sub>O(-) occurred in anaerobically or aerobically incubated waterlogged soil and in anaerobic but not in aerobic moist soil. (Skogerboe-Colorado State)  
W78-11039

#### FACTORS INFLUENCING THE LOSS OF ORGANIC CARBON FROM WHEAT ROOTS

Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.  
J. K. Martin.  
Soil Biology and Biochemistry, Vol. 9, No. 1, p 1-7, 1977. 6 tab, 18 ref.

**Descriptors:** \*Carbon, \*Wheat, \*Root systems, Soils, Soil investigations, Crop response, Soil microorganisms, \*Organic matter.

Wheat plants were grown in an atmosphere containing <sup>14</sup>CO<sub>2</sub> at temperatures of 10C or 18C for periods from 3-8 weeks. The plant roots were maintained under sterile or non-sterile conditions in soil contained in sealed pots which were flushed to displace respired <sup>14</sup>CO<sub>2</sub>. The <sup>14</sup>C content of the shoots, roots and soil was measured at harvest. The loss of <sup>14</sup>C from the roots, expressed either in terms of total <sup>14</sup>C recovered from the pots or <sup>14</sup>C translocated to the roots, ranged from 14.3-22.6%, mean 17.3% or 29.2-44.4%, mean 39.2%, respectively. (Skogerboe-Colorado State)  
W78-11042

#### EFFECT OF NITROGEN DIOXIDE ON NITRITE OXIDATION AND NITRITE-OXIDIZING POPULATIONS IN SOIL

Cornell Univ., Ithaca, NY. Lab. of Soil Microbiology.  
W. C. Gbureck, and M. Alexander.  
Soil Biology and Biochemistry, Vol. 9, No. 5, p 353-355, 1977. 2 fig, 9 ref.

**Descriptors:** \*Nitrogen, \*Nitrites, \*Oxidation, Soils, Soil investigations, \*Soil chemistry.

When nitrogen dioxide was added to soil at a rate equivalent to 51 micro-g N g<sup>-1</sup> soil, the nitrite formed was oxidized logarithmically. The numbers of nitrite-oxidizing microorganisms also increased logarithmically, but the final count was too low to account for the amount of nitrite metabolized. In soil treated with NO<sub>2</sub> at a rate equivalent to 106 micro-g N g<sup>-1</sup>, the nitrite formed was oxidized, but the counts of autotrophic nitrite oxidizers did not rise. Discrepancies between predicted bacterial numbers and nitrifying activity were also noted in soils amended with nitrite. (Skogerboe-Colorado State)  
W78-11043

#### SOIL LOSS EQUATION: DERIVATION FOR STEEP SLOPES

Missouri Univ.-Columbia. Dept. of Agricultural Engineering.  
For primary bibliographic entry see Field 2J.  
W78-11045

#### NITROGEN ISOTOPE DISCRIMINATION IN DENITRIFICATION OF NITRATE IN SOILS

Iowa State Univ., Ames. Dept. of Agronomy.  
For primary bibliographic entry see Field 2K.  
W78-11052

## Field 2—WATER CYCLE

### Group 2G—Water In Soils

**STERILITY IN RICE CULTIVARS AS INFLUENCED BY MSMA RATE AND WATER MANAGEMENT.**  
Arkansas Agricultural Experiment Station, Stuttgart. Rice Branch Experiment Station.  
For primary bibliographic entry see Field 5B.  
W78-11053

**AMMONIA VOLATILIZATION FROM SURFACE APPLICATIONS OF AMMONIUM COMPOUNDS TO CALCAREOUS SOILS: VI. EFFECTS OF INITIAL SOIL WATER CONTENT AND QUANTITY OF APPLIED WATER.**  
Texas A and M Univ., El Paso. Agricultural Research Station.  
L. B. Fenn, and R. Escarzaga.  
Soil Science Society of America Journal, Vol. 41, No. 2, p 358-363, March-April, 1977. 5 fig, 1 tab, 12 ref.

Descriptors: \*Ammonia, Soils, Soil investigations, Irrigation, Irrigation effects, Soil water, \*Soil moisture, \*Soil water movement, \*Application rates, \*Calcareous soils.

Ammonia losses from  $(\text{NH}_4)_2\text{SO}_4$  (AS) and  $\text{NH}_4\text{NO}_3$  (AN) applied to the surface of initially wet and initially dry soils, when followed by irrigation, were generally greater from the initially wet soils, especially when water application rates were <2.5 cm. The greatest  $\text{NH}_3$  loss occurred at the lowest water addition and the least loss at the highest water addition. The addition of 20.3 cm of water to a Harkey silty clay load did not reduce  $\text{NH}_3$  loss below that found with the addition of 5.1 cm of water. Ammonium was moved deeper into the soil by water in the initially wet soil than into the initially dry soil. (See also W77-09960 and W77-01515) (Skogerboe-Colorado State)  
W78-11054

**SEARCH FOR NITRIFYING AGENTS IN WATER AND SOILS AS SOURCES OF NITRATES IN SURFACE WATER.**  
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.  
For primary bibliographic entry see Field 5B.  
W78-11063

**LARGE CROP YIELD IS A MAJOR GOAL OF IRRIGATION.**  
Universal Oil Products, Inc., Saint Paul, MN. Johnson Div.  
For primary bibliographic entry see Field 3F.  
W78-11068

**EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS SYMPOSIUM.**  
International Association of Hydrological Sciences, Paris (France).  
For primary bibliographic entry see Field 2J.  
W78-11113

**ESTIMATING FIELD EROSION LOSSES FROM FALLOUT CESIUM-137 MEASUREMENTS.**  
Agricultural Research Service, Oxford, MS. Sedimentation Lab.  
For primary bibliographic entry see Field 2J.  
W78-11116

**SOIL EROSION POWER OF RAINFALL IN THE DIFFERENT ZONES OF SRI LANKA.**  
Department of Irrigation, Colombo (Sri Lanka). Land Use Div.  
For primary bibliographic entry see Field 2J.  
W78-11118

**METHODS FOR COMPUTATION OF RUNOFF AND SEDIMENT YIELD FROM SLOPES USED FOR AGRICULTURAL NEEDS.**  
Gosudarstvennyi Gidrolicheskiy Inst., Leningrad (USSR).

For primary bibliographic entry see Field 2J.  
W78-11119

**FACTORS INFLUENCING EROSION IN DISPERSIVE CLAY AND METHODS OF IDENTIFICATION.**  
California Univ., Davis. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 2J.  
W78-11121

**RELATIONSHIP BETWEEN SOIL EROSION AND SEDIMENT DELIVERY.**  
Agricultural Research Service, Beltsville, MD.  
For primary bibliographic entry see Field 2J.  
W78-11131

**PIPING IN THE MILK RIVER CANYON, SOUTHEASTERN ALBERTA-A TEMPORARY DRYLAND GEOMORPHIC PROCESS.**  
Queens Univ., Kingston (Ontario). Dept. of Geography.  
For primary bibliographic entry see Field 2J.  
W78-11138

**CHARGE CHARACTERISTICS OF SPODIC HORIZONS.**  
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.  
M. R. Laverdiere, and R. M. Weaver.  
Soil Science Society of America Journal, Vol. 41, No. 3, p 505-510, May-June 1977. 5 fig, 5 tab, 22 ref.

Descriptors: Soils, Soil investigations, Soil properties, Organic matter, Adsorption, \*Spodosols, \*Soil physical properties.

Surface charge properties of six Spodosol Bir horizons, enriched in sesquioxides and organic matter, were investigated by acid-base potentiometric titrations and ion adsorption measurements. The results indicate that the horizons have electrochemical properties similar to constant surface potential colloids, as the sign and magnitude of the net charge were dependent upon the pH and electrolyte concentration of the ambient solution. The pH values at which the net surface charge underwent reversal ranged from 4.2 to 4.9, and the values obtained by acid-base potentiometric titrations agreed fairly well with those obtained by ion adsorption measurements. (Skogerboe-Colorado State)  
W78-11200

**INORGANIC PHOSPHORUS SPECIES AND TRANSFER MECHANISMS IN SOILS TO SEDIMENTS FOR TWO SMALL KANSAS WATERSHEDS.**  
Kansas Water Resources Research Inst., Manhattan.  
For primary bibliographic entry see Field 5B.  
W78-11206

**BENZIMIDAZOLE FUNGITOXICANTS IN VIRGINIA SOILS: MOVEMENT, DISAPPEARANCE, AND EFFECT ON MICROORGANISMS.**  
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.  
For primary bibliographic entry see Field 5B.  
W78-11215

**REFRACTORY ORGANIC COMPOUNDS IN TREATED EFFLUENT AND THEIR REMOVAL BY SOIL.**  
MILILANI, OAHU, HAWAII.  
Hawaii Univ. Honolulu. Water Resources Research Center.  
For primary bibliographic entry see Field 5A.  
W78-11220

## 2H. Lakes

**PARTITIONING AND TRANSPORT OF LEAD IN LAKE WASHINGTON.**  
Duke Univ., Beaufort, NC. Marine Lab.  
For primary bibliographic entry see Field 5B.  
W78-10603

**NUMERICAL SIMULATION OF STEADY STATE THREE-DIMENSIONAL GROUND-WATER FLOW NEAR LAKES.**  
Geological Survey, Denver, CO. Water Resources Div.  
For primary bibliographic entry see Field 2F.  
W78-10642

**THE IMPACT OF HUMAN TRAMPLING ON PHOSPHORUS LOADING TO A SMALL LAKE IN GATINEAU PARK, QUEBEC, CANADA.**  
Brock Univ., St. Catharines (Ontario). Dept. of Biological Sciences.  
For primary bibliographic entry see Field 5C.  
W78-10653

**MIXING EFFECTS DUE TO BOATING ACTIVITIES IN SHALLOW LAKES.**  
Florida Technological Univ., Orlando. Dept. of Civil Engineering and Environmental Science.  
For primary bibliographic entry see Field 5B.  
W78-10734

**EFFECTS OF ACID PRECIPITATION ON MACROPHYTES IN OLIGOTROPHIC SWEDISH LAKES.**  
Swedish Water and Air Pollution Research Lab., Gothenburg.  
For primary bibliographic entry see Field 5C.  
W78-10742

**HEAVY METAL TOXICITY AND SYNERGISM TO NATURAL PHYTOPLANKTON IN THE EUTROPHIC ALPNACHERSEE AND THE MESOTROPHIC HORW BAY (IN GERMAN).**  
Eidgenossische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).  
For primary bibliographic entry see Field 5C.  
W78-10753

**PUBLIC ACCESS TO THE GREAT LAKES. A POLICY STUDY/1976.**  
Wisconsin Coastal Management Program, Madison.  
For primary bibliographic entry see Field 6E.  
W78-10756

**FEATURES OF FORMATION OF SHORES OF VILYUY RESERVOIR.**  
For primary bibliographic entry see Field 2J.  
W78-10935

**RELATIONSHIP BETWEEN LAKE-INDUCED DISTURBANCES AND SYNOPTIC CIRCULATION.**  
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.  
J. M. Gross.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 406, Price codes: A04 in paper copy, A01 in microfiche. Final Report, December 1976. 67 p, 42 fig, 6 tab, 26 ref. NOAA 04-5-022-23.

Descriptors: \*Lakes, Effects, \*Weather, \*Model studies, \*Lake Ontario, Mathematical models, Numerical analysis, Latent heat, Synoptic analysis, Winds, Air circulation, Orography, Storms, Rainfall, Atmosphere, Cloud physics, Meteorology, \*Lake effect storms.

A theoretical model was described which is suitable for studying lake-induced disturbances for Lake Ontario. The model is based on the time dependent, nonlinear primitive equations in the sigma coordinate system. The model incorporates parameterizations for vertical and horizontal turbulent eddy fluxes and the release of latent heat. The model also incorporates a method of varying the synoptic conditions with time. A numerical formulation of the theoretical model was discussed. The numerical model was used to conduct a series of sensitivity studies in order to determine the relative importance of various physical processes on development of lake-effect storm. It was found that surface heating alone causes maximum convergence farther from the lake than when the release of latent heat is included in the computation. Including orography in the computation also augments the convergence. Changes in wind direction cause the lake-effect disturbance to move to the lee side of the lake. (Sims-LSWS)  
W78-10938

**TEMPERATURE ANALYSIS AND SELECTIVE-WITHDRAWAL DESIGN STUDY TALLAHALA CREEK LAKE, MISSISSIPPI; MATHEMATICAL MODEL INVESTIGATION,**  
Army Engineer Waterways Experiment Station, Vicksburg, MS.  
For primary bibliographic entry see Field 5B.  
W78-10946

**ENHANCEMENT OF RELEASES FROM A STRATIFIED IMPOUNDMENT BY LOCALIZED MIXING, OKATIBBEE LAKE, MISSISSIPPI,**  
Army Engineer Waterways Experiment Station, Vicksburg, MS.  
For primary bibliographic entry see Field 5G.  
W78-10950

**AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO, APPENDIX B: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF BOTTOM SEDIMENTATION,**  
Nalco Environmental Sciences, Northbrook, IL.  
For primary bibliographic entry see Field 5E.  
W78-10961

**ZINC, CADMIUM AND LEAD IN WATER, SEDIMENTS AND SUBMERGED PLANTS OF THE DERWENT RESERVOIR, NORTHERN ENGLAND,**  
Durham Univ. (England). Dept. of Botany.  
For primary bibliographic entry see Field 5B.  
W78-11006

**PRELIMINARY OBSERVATIONS ON THE PRODUCTIVITY OF PERIPHYTON ATTACHED TO FRESHWATER ARTIFICIAL TIRE REEF,**  
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.  
For primary bibliographic entry see Field 5C.  
W78-11021

**SOME EFFECTS OF PAPER AND PULP MILL EFFLUENTS ON SOUTHERN LAKE SAIMAA,**  
Limnological Inst., Oosterzee (Netherlands).  
For primary bibliographic entry see Field 5C.  
W78-11023

**CHANGES IN FISHES WITH CULTURAL LAKE EUTROPHICATION (FISCHEREILICHE VERÄNDERUNGEN IN KULTURBEDINGT EUTROPHIERENDEN SEEN),**  
Staatliche Inst. fuer Seenforschung und Fischereiwesen, Langenargen (West Germany).  
For primary bibliographic entry see Field 5C.  
W78-11026

**THE REGIME OF THE SUSPENDED SEDIMENT YIELD IN THE RIVERS TO LAKE CHAD: SUMMARY OF STUDIES BY ORSTOM IN THE REPUBLIC OF CHAD (REGIME DES APPORTS FLUVIATILES DE MATERIAUX SOLIDES EN SUSPENSION VERS LE LAC TCHAD: SYNTHESE DES ETUDES DE L'ORSTOM EN REPUBLIQUE DE TCHAD),**  
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena.  
For primary bibliographic entry see Field 2J.  
W78-11127

**EFFECT OF A THERMAL GENERATING STATION ON DISSOLVED SOLIDS AND HEAVY METALS IN A PRAIRIE RESERVOIR,**  
Saskatchewan Dept. of the Environment, Regina. Inland Waters Directorate.  
For primary bibliographic entry see Field 5B.  
W78-11189

**STATISTICAL PROCEDURES FOR CLASSIFICATION OF A LAKE,**  
Canada Centre for Inland Waters, Burlington (Ontario).  
A. H. El-Shaarawi, and K. R. Shah.  
Scientific Series No. 86, 1978, 9 p, 5 fig, 2 tab.

Descriptors: \*Statistical methods, \*Classification, \*Variability, \*Lake stages, \*Limnology, Phytoplankton, Biomass, Lake Superior, Data collections.

Statistical classification procedures for univariate and multivariate limnological data are presented. A regression model in terms of additive temporal and spatial components is fitted to the data after a search for an appropriate transformation. When the spatial component is found to be significant, a hierarchical procedure is suggested to divide the lake into regions. The procedure is illustrated using the data on phytoplankton biomass from Lake Superior collected in 1973. (WATDOC)  
W78-11192

**TURBULENT DIFFUSION PROCESSES IN THE GREAT LAKES,**  
Canada Centre for Inland Waters, Burlington (Ontario).  
C. R. Murthy, and K. C. Miners.  
Scientific Series No. 83, 1978, 27 p, 23 fig, 16 ref, 1 tab, append.

Descriptors: \*Fluorescence, \*Fluorometry, \*Turbulent boundary layers, \*Great Lakes, Oceans, Diffusion, Instrumentation, Model studies, Analytical techniques, Dye releases, Tracers, Field equipment.

Detailed descriptions of the instrumentation, field equipment, experimental design and procedure widely used for conducting large-scale diffusion experiments in natural bodies of water such as the oceans and the Great Lakes are presented. The data analysis methods of continuous dye plume and instantaneous dye patch diffusion experiments are also given. Experimental data obtained in widely varying environmental conditions are interpreted statistically by constructing diffusion characteristics based on a simple theoretical framework. (WATDOC)  
W78-11193

**THE RECENT HISTORY OF PRODUCTIVITY IN SELECTED BERKSHIRE LAKES,**  
Massachusetts Univ., Amherst. Dept. of Zoology.  
For primary bibliographic entry see Field 5C.  
W78-11203

**CHEMICAL AND BIOLOGICAL QUALITY OF LAKES FAITH, HOPE, AND CHARITY, AT MAITLAND, FLORIDA, WITH EMPHASIS ON**

**THE EFFECTS OF STORM RUNOFF AND BULK PRECIPITATION, 1971-74,**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
For primary bibliographic entry see Field 5B.  
W78-11259

**NITROGEN REGIME OF SHALLOW EUTROPHIC LAKES ON THE CANADIAN PRAIRIES,**  
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.  
For primary bibliographic entry see Field 5C.  
W78-11278

**ESTIMATED RESPONSES OF LAKE ONTARIO PHYTOPLANKTON BIOMASS TO VARYING NUTRIENT LEVELS,**  
Manhattan Coll., Bronx, NY. Dept. of Environmental Engineering and Science.  
For primary bibliographic entry see Field 5C.  
W78-11279

**MODEL OF PRIMARY PRODUCTION, INCLUDING CIRCULATION INFLUENCES, IN LAKE SUPERIOR,**  
Canada Centre for Inland Waters, Burlington (Ontario).  
For primary bibliographic entry see Field 5C.  
W78-11280

**SEASONAL AND HORIZONTAL DISTRIBUTIONS OF PLANKTONIC CRUSTACEA IN GEORGIAN BAY AND NORTH CHANNEL, 1974,**  
Waterloo Univ. (Ontario) Dept. of Biology.  
For primary bibliographic entry see Field 5C.  
W78-11282

**THE VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL IN LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO: IMPLICATIONS FOR PRIMARY PRODUCTION ESTIMATES,**  
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.  
For primary bibliographic entry see Field 5C.  
W78-11289

**VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL A IN LAKE MICHIGAN,**  
Wisconsin Univ.-Milwaukee. Dept. of Zoology.  
For primary bibliographic entry see Field 5C.  
W78-11291

## 21. Water In Plants

**THE FLORA OF DREDGED MATERIALS SITES IN NAVIGATION POOL # OF THE UPPER MISSISSIPPI RIVER,**  
Wisconsin Univ.-La Crosse.  
For primary bibliographic entry see Field 5E.  
W78-10947

**COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME I: PRODUCTIVITY,**  
Louisiana State Univ., Baton Rouge.  
For primary bibliographic entry see Field 5C.  
W78-10952

**COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME II: GROWTH DYNAMICS,**  
Louisiana State Univ., Baton Rouge.  
For primary bibliographic entry see Field 5C.  
W78-10953



## Field 2—WATER CYCLE

### Group 21—Water In Plants

**PRIMARY PRODUCTIVITY OF MINOR MARSH PLANTS IN DELAWARE, GEORGIA, AND MAINE,**  
Georgia Univ., Brunswick. Marine Resources Extension Center.  
For primary bibliographic entry see Field 5C.  
W78-10956

**WATER RELATIONS OF COTTON. II. CONTINUOUS ESTIMATES OF PLANT WATER POTENTIAL FROM STEM DIAMETER MEASUREMENTS,**  
Agricultural Research Service, Auburn, AL.  
For primary bibliographic entry see Field 3F.  
W78-11055

### 2J. Erosion and Sedimentation

**EFFECT OF MULCHING ON SEDIMENT IN RUNOFF FROM SIMULATED RAINFALL,**  
California Univ., Davis. Dept. of Land, Air, and Water Resources.  
For primary bibliographic entry see Field 4D.  
W78-10522

**SEDIMENT DISCHARGE OF ALLUVIAL STREAMS CALCULATED FROM BED-FORM STATISTICS,**  
Agricultural Research Service, Oxford, MS. Sedimentation Lab.  
J. C. Willis, and J. F. Kennedy.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 634, price codes: A10 in paper copy, A01 in microfiche.  
Iowa Institute of Hydraulic Research Report No. 202, June 1977. 215 p, 26 fig, 6 tab, 49 ref.

Descriptors: \*Sediment transport, \*Bed load, \*Suspended solids, \*Model studies, Hydraulic models, Flumes, Mathematical models, Streams, Streamflow, Sediments, Data processing, Analytical techniques, Beds, Beds under water, Instrumentation, Laboratory tests, Mathematics, Statistics.

The total sand of a stream was treated as the sum of two parts - that contributed by the downstream migration of bed forms as 'dune load' and that carried over the separation zones of dune troughs as 'suspended load'. Development of methods for calculating these loads from concepts closely related to the physical transport processes was the overall objective of this study. Other related objectives were to define the various functions used in the calculation procedure and to relate the parameters of the functions to measurable flow variables. The dune load was derived as the sum of the contributions by Fourier frequency components of bed elevation records. The distribution of the flux rate of suspended sediment over the flow depth was derived from published models for the velocity and concentration distribution for reference concentrations based on the effective bed concentration. This effective bed concentration was defined as the product of the bulk density of the bed material and the fraction of the time or distance during which the bed surface remained above the reference level. New data from a series of laboratory flume tests with equilibrium flows and bed forms were used to supplement existing data and to define the various functions and parameters entering the load calculations. These data included temporal and spatial bed elevation records for different flow rates and water temperatures. Total load measurements provided a check of the load calculations and an aid in developing the empirical aspects of the calculation procedure. (Sims-ISWS)  
W78-10535

**INFLUENCE OF ENVIRONMENTAL PARAMETERS ON EDTA BIODEGRADATION IN SOILS AND SEDIMENTS,**  
Michigan State Univ., East Lansing. Dept. of Crop and Soil Science.  
J. M. Tiedje.  
Journal of Environmental Quality, Vol 6, No 1, p 21-26, January-March 1977. 4 fig, 3 tab, 20 ref.

Descriptors: Soils, Soil investigations, \*Soil texture, \*Sediments, Sedimentation, \*Chelation, \*EDTA, \*Biodegradation, Detroit River, Com-metabolism, Metabolism.

14C-EDTA (8ethylenediaminetetraacetate) was slowly degraded to 14C02 by all soils tested from the major agricultural EDTA use areas; by soils varying in uses, pH, and texture; and by sediments from the Detroit River. EDTA degradation appears to be a result of cometabolism by established microbial populations. Production of 14C02 from EDTA occurred under aerobic but aerobic but not anaerobic conditions. No detectable quantities of intermediates accumulated under either condition. EDTA degradation followed first-order kinetics for concentrations ranging from 0.4 to 90 ppm. Degradation was observed up to 1,000 ppm EDTA, the highest concentration tested. The date of sample collection had a marked effect on extent of degradation with the winter-collected samples showing greater than twice the degradation of summer-collected samples. The Q10 was two up to 30C. Initially degradation at 50C was limited, but after 9 weeks incubation the rate accelerated indicating the adaptation of thermo-tolerant EDTA-degrading populations. The extent of degradation among soils was variable; common values for 2 to 4 ppm of added 14C-EDTA mineralized were 13 to 45% after 15 weeks and 65 to 70% after 45 weeks. (Skogerboe-Colorado State)  
W78-10591

**A LABORATORY STUDY ON THE ROLE OF STREAM SEDIMENT IN NITROGEN LOSS FROM WATER,**  
Guelph Univ. (Ontario). Dept. of Environmental Biology.  
For primary bibliographic entry see Field 5B.  
W78-10602

**TRANSPORT AND DISPERSION OF FLUORESCENT TRACER PARTICLES FOR THE DUNE-BED CONDITION, ATRISCO FEEDER CANAL NEAR BERNALILLO, NEW MEXICO,**  
Geological Survey, Bay Saint Louis. MS. Water Resources Div.; and Geological Survey, Menlo Park, CA. Water Resources Div.  
R. E. Rathburn, and V. C. Kennedy.  
Available from Supt. of Documents, GPO, Washington, DC 20402; price, \$3.75. Professional Paper 1037, 1978. 95 p, 48 fig, 1 plate, 55 tab, 35 ref.

Descriptors: \*Sediment transport, \*Tracers, \*Fluorescent dye, Particle size, \*Alluvial channels, Marking techniques, Sedimentation, Sediment distribution, Dispersion, Evaluation, \*New Mexico, \*Atrisco Feeder Canal (N Mex), \*Dune-bed condition, Dye-coated particles.

A fluorescent tracer technique was used to study the rates of transport and dispersion of sediment particles of various diameters and specific gravities for a dune-bed condition in an alluvial channel, Atrisco Feeder Canal near Bernalillo, N. Mex. The total transport rates of bed material measured by the steady-dilution and spatial-integration procedures were within the range of transport rates computed by the modified Einstein procedure. Lateral dispersion of the tracer particles increased with increase in the size of the tracer particles, whereas longitudinal dispersion decreased. The velocities of the tracer particles decreased with increase in the size of the tracer particles; dependence on particle diameter was

large for the small particles, small for the large particles. Tracers were found at larger depths in the bed than would be expected on the basis of the sizes of the dunes in the channel. (Woodard-USGS)  
W78-10634

**SUSPENDED SEDIMENT IN THE CHESAPEAKE AND DELAWARE CANAL,**  
State Univ. of New York at Stony Brook. Marine Sciences Research Center.  
For primary bibliographic entry see Field 5B.  
W78-10666

**BENTHIC MOLLUSCAN ASSEMBLAGES IN RELATION TO SEDIMENT GRADIENTS IN NORTHEASTERN LONG ISLAND SOUND, CONNECTICUT,**  
City Univ. of New York. Inst. of Oceanography.  
For primary bibliographic entry see Field 5B.  
W78-10747

**CONSERVATION PROBLEMS IN THE NORFOLK BROADS AND RIVERS OF EAST ANGLIA, ENGLAND-PHYTOPLANKTON, BOATS AND THE CAUSES OF TURBIDITY,**  
University of East Anglia, Norwich (England). School of Environmental Sciences.  
For primary bibliographic entry see Field 5C.  
W78-10752

**TOTAL LOAD OF BED MATERIALS IN OPEN CHANNELS,**  
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.  
H. Kikkawa, and T. Ishikawa.  
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13895, p 1045-1059, July 1978. 10 fig, 12 ref, 2 append.

Descriptors: \*Bed load, \*Open channels, \*Model studies, Channel flow, Sediment transport, Stochastic processes, Suspended load, Hydraulics, Sedimentation, Equations, Mathematical models, \*Stochastic models, Bed material load, Sediment sources, Synthetic models.

Bed material load usually is classified into bed load and suspended load. They have been treated individually in the previous theoretical studies, but to obtain the expression of total load, their mutual relation must be formulated. The main objective in this investigation was to study this relation. The basic consideration was that the bed layer is formed under the balance of vertical forces acting on sediment particles near and on the bed surface, and this layer can be regarded as the source of sediments to be diffused to the region of suspended load. According to this consideration: (1) a new stochastic model that interrelates bed load and suspended load was considered to simulate the particle movement; and (2) the equation of dynamic balance in the bed layer was introduced and improved by using the results of basic experiments. A total load equation was derived by combining the results of two processes. The data presented by U.S.G.S. were used to verify it. (Let-ISWS)  
W78-10916

**LONGITUDINAL GRAIN SORTING BY CURRENT IN ALLUVIAL STREAMS,**  
Technical Univ. of Denmark, Lyngby.  
R. Deigaard, and J. Fredsoe.  
Nordic Hydrology, Vol. 9, No. 1, p 7-16, 1978. 5 fig, 10 ref.

Descriptors: \*Alluvial channels, \*Particle size, \*Currents (Water), Streambeds, Sediment transport, Bed load, Sedimentation, Hydraulics, Equations, Mathematical studies, \*Longitudinal grain sorting, Graded sediment, Grain sorting, Stream profiles.

The longitudinal profile was a formula of Fredsoe. The longitudinal profile in measurement curve input and concerning an elevation in the mean of the river logarithmically be logarithmically (Let-ISWS)  
W78-10924

**RADIATION REMOVALS IN MITRE C. A. Ghobad. Available Service Price code Report M 1977. 83 F19628-7**

Descriptors: \*Suspensions, \*Simulation, \*Clays, \*Grams, C.

High concentrations of chemical to a variety of conditions, economic and to the activities of the Research on sediment sensing laboratory whether and up to the properties descriptive have been program modeling was based (Sims-ISWS)  
W78-10916

**FREELI SOURCE WASHING Environ DC. Su For pri W78-10916**

**FEAT VILYU I.P. K. Availa tion Se 238, P micro 1977, of the Shores**

Descri mfrastr ture, Lakes

The longitudinal current sorting of graded sediment was analyzed by use of a sediment transport formula developed recently by Engelund and Fredsoe. The analysis yields that for a given longitudinal profile of a river, the longitudinal variation in mean grain diameter and the grain distribution curve is unique determined by the sediment input and water discharge. No requirement concerning an ultimate equilibrium state of the bed elevation is introduced. The analysis yields that the mean grain size will decrease as the slope of the river decreased; and further, that originally logarithmic normally distributed sand will tend to be logarithmic hyperbolic distributed after sorting. (Lee-ISWS)  
W78-10924

**RADIATIVE TRANSFER MODEL FOR REMOTE SENSING OF SUSPENDED SEDIMENTS IN WATER.**  
MITRE Corp., McLean, VA. METREK Div. A. Ghovanlou.  
Available from the National Technical Information Service, Springfield, VA 22161 as N77-32567, Price codes: A05 in paper copy, A01 in microfiche. Report MTR-7433, NASA CR-145145, February 1977, 83 p, 18 fig, 7 tab, 20 ref, 5 append. NASA F19628-77-C-0001.

Descriptors: \*Remote sensing, \*Turbidity, \*Suspended solids, Laboratory tests, Model studies, Mathematical models, Monte Carlo method, Simulation analysis, Water quality, Sediments, Clays, Radiation, Reflectance, Computer programs, Computer models.

High concentration of suspended particles in the environmental waters alters the physical and chemical properties of the water systems and leads to a variety of hazardous ecological impacts. In addition, excessive sedimentation leads to significant economic losses because of the reduction of the nation's reservoir and flood storage capacities, and to the necessary performance of operational activities, such as dredging. Considering the importance of this problem, NASA/Jangle Research Center has initiated a laboratory study on sediment characteristics as part of its remote sensing program in the area of water quality. The laboratory project was designed to determine whether the spectral characteristics of the radiance upwelling from an illuminated body of turbid water can be related to the amount and properties of the suspended particles. This report described an analytical study in the area of radiative transfer in the turbid water media. The work has been performed in support of the laboratory program in remote sensing of water quality. The modeling methodology described in this report was based on Monte Carlo simulation approach. (Sims-ISWS)  
W78-10930

**PRELIMINARY STUDY OF SEDIMENT SOURCES IN THE POTOMAC RIVER BASIN, WASHINGTON, D.C., METROPOLITAN AREA.**  
Environmental Protection Agency, Washington, DC. Surveillance Branch.  
For primary bibliographic entry see Field 5B.  
W78-10932

**FEATURES OF FORMATION OF SHORES OF VILYUY RESERVOIR.**  
I. P. Konstantinov, and V. L. Sukhodrovskiy.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 238, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 633, July 1977, 6 p, 4 tab. Translated from the Proceedings of the 4th AU Union Conference on Study of Shores, Yakutsk, p 11-16, 1975.

Descriptors: \*Reservoirs, \*Shores, \*Erosion, Permafrost, Rocks, Cold regions, Dams, Temperature, Waves(Water), Weathering, Bank erosion, Lakes.

This report briefly discussed the climate and features of formation of the shores of the Vilyuy Reservoir. A table of erodibility coefficients of the rocks that make up the shores of the reservoir was presented. (Sims-ISWS)  
W78-10935

**SEDIMENT OXYGEN DEMAND STUDIES OF SELECTED NORTH-EASTERN ILLINOIS STREAMS.**  
Illinois State Water Survey, Urbana.

T. A. Butts, and R. L. Evans.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 788, Price codes: A09 in paper copy, A01 in microfiche. Circular 129, 1978, 179 p, 12 fig, 16 tab, 20 ref, 8 append.

Descriptors: \*Sediments, \*Oxygen demand, \*Benthos, \*Streams, \*Illinois, Sampling, Cores, On-site data collections, Data processing, Mathematical models, Benthic fauna, Bacteria, Measurement, On-site investigations, Bottom sediments, Oxygen, \*Sediment oxygen demand.

Special field sampling equipment was designed and employed for gathering data concerning the oxygen consuming potential of bottom sediments and substrates in small streams in a six-county area in the northeastern corner of Illinois. The sampling program was designed so that results from selected sampling locations could be extrapolated for use throughout most natural streams and rivers in the study area, except for the Kankakee River and its tributaries. The data produced is readily usable for input into most dissolved oxygen oriented water quality models. Sediment oxygen demand (SOD) can be defined broadly as the usage of dissolved oxygen in the overlying water by benthic organisms. In stream waters, it results from the biochemical oxygen demands of micro- and macroorganisms. Sediment oxygen demand measurements were completed successfully at 89 different stations. Ninety-five stations were sampled for benthic macroinvertebrates with from May 2 through October 20, 1976. Sixty-one samples were collected with the Ekman dredge, 33 were collected with the ponar dredge, and 1 was a nonquantitative hand-picked sample. A total of 122 sediment samples were taken with either the ponar or Ekman dredge. Core samples were taken at 83 of the 89 SOD stations. The overall results of the study were very good. The information generated should provide a good base from which to estimate oxygen usage in streams due to a variety of benthic conditions. (Sims-ISWS)  
W78-10943

**IMPACT OF FLUID MUD DREDGED MATERIAL ON BENTHIC COMMUNITIES OF THE TIDAL JAMES RIVER, VIRGINIA.**  
Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography.  
For primary bibliographic entry see Field 5C.  
W78-10944

**A LABORATORY STUDY OF THE TURBIDITY GENERATION POTENTIAL OF SEDIMENTS TO BE DREDGED.**  
Abcor, Inc., Wilmington, MA. Walden Research Div.  
B. A. Wechsler, and D. R. Cogley.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A053 029, Price codes: A03 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-14, November 1977, 177 p, 26 fig, 7 tab, 41 ref, 8 append.

Descriptors: \*Turbidity, \*Dredging, \*Sediments, \*Settling velocity, Suspension, Laboratory tests, \*Dredged material.

In order to understand the effects of physical and chemical factors which control particle settling rates and thereby develop the means to predict the extent of dredging-related turbidity, a series of laboratory jar tests was performed. The turbidity of suspensions of three pure clay samples and eight natural sediments was monitored as a function of time in waters of various salinity, hardness, and pH. The results were statistically analyzed to relate specific sediment and water compositional factors to observed settling rates and to evaluate their relative importance. Additional experiments were performed to characterize the nature of turbidity. While turbidity was found to be extremely persistent in soft fresh waters, hardness (200 mg/l) and particularly salinity (1-5 ppt) induced flocculation and consequently rapid settling. The organics content was the principal sediment component affecting turbidity, with higher organics levels correlated with more rapid settling in salt water. No significant segregation of sediment components was observed during settling, with the exception of coarser silt particles, which settled independently of clay-organic aggregates. A turbidity plume model was developed which accounts for flocculation in suspensions of dredged material. (WES)  
W78-10951

**AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO, APPENDIX B: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF BOTTOM SEDIMENTATION.**  
Nalco Environmental Sciences, Northbrook, IL.  
For primary bibliographic entry see Field 5E.  
W78-10961

**SOIL EROSION AND ITS CONTROL IN EASTERN WOODLANDS.**  
Northeastern Forest Experiment Station, Broomall, PA.  
J. H. Patric.  
Northern Logger and Timber Processor 25(11), 1977, p 4, p 5, p 22, p 23, p 31, 17 ref.

Descriptors: Erosion, \*Erosion control, Overland flow, Water quality, Logging roads, \*Soil erosion, Forests, Forest management, \*Appalachian mountain region.

Overland flow rarely occurs in eastern hardwood forests. Tree cutting has only a negligible and temporary effect on soil erosion rates and stream pollution. Logging roads are the source of most water quality problems on logged areas. (Forest Service)  
W78-10987

**SOIL LOSS EQUATION: DERIVATION FOR STEEP SLOPES.**  
Missouri Univ.-Columbia. Dept. of Agricultural Engineering.  
J. M. Gregory, H. P. Johnson, and D. Kirkham.  
Paper No. 77-2525 presented at the 1977 Winter Meeting of the American Society of Agricultural Engineers, December 13-16, 1977, Chicago, Illinois, 29 p, 4 fig, 1 tab, 10 ref.

Descriptors: Model studies, Simulation analysis, \*Sediment transport, Erosion, \*Soil erosion, \*Slopes, \*Equations.

An equation has been derived for the prediction of soil loss from areas with steep slopes. The equation compares favorably with the Universal Soil Loss Equation for flat slopes (0-20 percent) and agrees with experimental results in the literature for steep slopes (20-100 percent). (Skogerboe-Colorado State)  
W78-11045

**DISPOSAL AND UTILIZATION OF HYDRAULICALLY DREDGED LAKE SEDIMENTS IN LIMITED CONTAINMENT AREAS.**  
Massachusetts Univ., Amherst. Dept. of Civil Engineering.

## Field 2—WATER CYCLE

### Group 2J—Erosion and Sedimentation

For primary bibliographic entry see Field 5E.  
W78-11067

#### EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS SYMPOSIUM.

International Association of Hydrological Sciences, Paris (France).  
Proceedings of the Paris Symposium, July 1977; International Association of Hydrological Sciences Publication No. 122, July 1977. 352 p. c/o American Geophysical Union, Washington, D.C. \$25.00.

Descriptors: \*Conferences, \*Erosion, \*Sediment yield, \*Sediment transport, \*Model studies, \*Mathematical models, \*Soil erosion, \*Bed load, \*Suspended load, \*Watersheds(Basins), \*Rivers, \*Runoff, \*Sediment discharge, \*Erosion rates, \*Semiarid climates, \*Hydraulic structures, \*Intakes, \*Humid areas, \*Foreign countries, \*Foreign research, \*Sediment control, \*Canals, \*Open channels, \*Tropical regions, \*Land use, \*Impact(Rainfall).

Erosion and sediment transport were discussed at a symposium held at Paris in 1977. The broad subject areas discussed were: estimation of erosion sediment yield parameters in basins with deficient sediment data: the relationship between source-area erosion and sediment yield (delivery ratio); development of mathematical models for erosion and solid matter transport; study of sediment generation, transport, and deposition in semiarid zones; and sediment problems related to intake structures and the influence of intakes on the sediment regime of rivers. (See also W78-11114 thru W78-11150) (Humphreys-ISWS)  
W78-11113

#### RECONNAISSANCE MEASUREMENTS AND SEDIMENT YIELD ESTIMATES IN BASINS WITH INSUFFICIENT DATA.

Technical Univ. of Prague (Czechoslovakia).  
V. Kolar.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977; International Association of Hydrological Sciences Publication No. 122, p 3-10, July 1977. 1 fig, 1 tab, 5 ref.

Descriptors: \*Surveys, \*On-site investigations, \*Sediment yield, \*Watersheds(Basins), \*Investigation, \*Exploration, \*Rivers, \*River basins, \*Suspended solids, \*Sediments, \*Discharge(Water), \*Sampling, \*Foreign countries, \*Czechoslovakia, \*Sediment concentrations.

Data necessary for decisions as to whether sedimentation basins should be built on tributary streams flowing into 36 reservoirs in Czechoslovakia were furnished by reconnaissance surveys in 210 river basins. The data consisted of checking divides, drainage networks, erosion areas, vegetative cover, reservoirs, flood plains, channels, landslides, human activities, gauges, etc., and included sampling of sediment and bed material. Discharge and wash load were measured in selected cross sections. Methods of measurements were checked in experimental basins. Data therefrom were used to develop evaluation procedures. For shallow streams, a bottle wash-load sampler was developed. For evaluation of the relationship between sediment concentration  $c$  and water discharge  $Q$ , the equation  $c = a \text{ times } Q$  to the  $f$  power was used and was found to be time dependent. In spite of the limited period of observations, the tentative conclusions that sedimentation basins would not be necessary was confirmed subsequently for all reservoirs put into operation. (See also W78-11113) (Humphreys-ISWS)  
W78-11114

#### THE SIGNIFICANCE OF INFREQUENT HIGH SUSPENDED SEDIMENT CONCENTRATIONS

#### IN THE ESTIMATION OF ANNUAL SEDIMENT TRANSPORT.

Research Inst. for Water Resources Development, Budapest (Hungary).  
L. Rakoczi.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977; International Association of Hydrological Sciences Publication No. 122, p 19-25, July 1977. 1 fig, 1 tab, 4 ref.

Descriptors: \*Suspended solids, \*Sediment discharge, \*Estimating, \*Rivers, \*Sediment transport, \*Rating curves, \*Frequency, \*Analytical techniques, \*Annual, \*Forecasting, \*Sampling, \*Sediments, \*Variability, \*Discharge(Water), \*Foreign research, \*Hungary, \*Peak sediment concentration, \*Sediment concentration.

In order to estimate the long-term suspended sediment transport of streams more reliably, selection of the most suitable time periods and frequencies for sediment sampling were considered. A basis was provided for deciding on the application of traditional or in situ methods of concentration measurement. The main causes of the often poor correlation between discharge and suspended sediment transport were explained, and a method of allowing for most their effects was proposed. Using the example of a Hungarian river, the new procedure takes into consideration the characteristics of the flow regime and, therefore, estimates the average annual suspended sediment transport more realistically than the traditional calculation methods based on flow frequencies or durations which disregard and conceal the process character of sediment movement. (See also W78-11113) (Humphreys-ISWS)  
W78-11115

#### ESTIMATING FIELD EROSION LOSSES FROM FALLOUT CESIUM-137 MEASUREMENTS.

Agricultural Research Service, Oxford, MS. Sedimentation Lab.  
J. R. McHenry, and J. C. Ritchie.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977; 2 fig, 3 tab, 23 ref. ERDA E-(49-7)-3029.

Descriptors: \*Soil erosion, \*Soil profiles, \*Wisconsin, \*Watersheds(Basins), \*Erosion, \*Sediment yield, \*Tracers, \*Measurements, \*On-site tests, \*On-site investigations, \*Sampling, \*Soil investigations, \*Cesium, \*Estimating.

Estimates of soil erosion losses from fields or basins can be made using empirically derived soil loss equations, such as the universal soil loss equation, or they can be made from sediment yield data assuming a sediment delivery ratio. Neither method is capable of describing the movement of soil within a field or basin. Actual amounts of soil loss and deposition within a individual cultivated field were determined in this study from measurements of the radioactive cesium-137 content of soil profiles. These values were compared with those obtained for uneroded, undisturbed soil profiles, and the loss of 137Cs from cultivated areas was correlated with soil loss. The fallout 137Cs normally remained concentrated in the surface soil because of its strong adsorption by the colloidal soil particles, and thus, its resistance to desorption and downward movement in the soil profile in percolating waters. In cultivated fields, 137Cs was distributed throughout the plow depth. When 137Cs was found in a soil profile below the normal plow depth, accumulation of soil was apparent. When the 137Cs content of the soil profile was less than in the undisturbed area, the soil loss was assumed proportional to the 137Cs loss. On the Wisconsin field sites described, erosional losses and accumulations of 10 cm or more have occurred in 10 years. (See also W78-11113) (Humphreys-ISWS)  
W78-11116

#### LIMITATIONS OF THE RATING CURVE TECHNIQUE FOR ESTIMATING SUSPENDED SEDIMENT LOADS, WITH PARTICULAR REFERENCE TO BRITISH RIVERS.

Exeter Univ. (England). Dept. of Geography.  
D. E. Walling.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977; International Association of Hydrological Sciences Publication No. 122, p 34-48, July 1977. 6 fig, 6 tab, 33 ref.

Descriptors: \*Suspended load, \*Rating curves, \*Analytical techniques, \*Duration curves, \*Suspended solids, \*On-site investigations, \*Sampling, \*Analysis, \*On-site data collections, \*Flow duration, \*Estimating, \*Rivers, \*Sediment discharge, \*Variability, \*Reliability, \*Foreign research, \*United Kingdom, \*Sediment concentration.

In the past, the rating curve technique sometimes has been utilized with little regard for its careful application, its limitations, and the possible errors involved. Some of the errors associated with combining the rating curve and the flow record were considered. More attention needs to be directed towards the reliability and accuracy of the resultant values of sediment load. Continuously monitored sediment concentration data from three rivers in Devon, England, also were used to evaluate the inherent inaccuracy of rating curve estimates of sediment load. Results presented suggest that significant errors can be associated with the use of the rating curve technique for estimating sediment loads, particularly in small basins. Errors of + or - 50% or more may be associated with many rating curve estimates of sediment load. Critical evaluation of sediment load data is necessary if this is to be used in further analysis, and it was suggested that rating curve procedures should be used only if the potential errors are recognized and judged acceptable for the purposes involved. (See also W78-11113) (Humphreys-ISWS)  
W78-11117

#### SOIL EROSION POWER OF RAINFALL IN THE DIFFERENT ZONES OF SRI LANKA.

Department of Irrigation, Colombo (Sri Lanka). Land Use Div.  
W. D. Joshua.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977; International Association of Hydrological Sciences Publication No. 122, p 51-61, July 1977. 4 fig, 2 tab, 7 ref.

Descriptors: \*Soil erosion, \*Impact(Rainfall), \*Rainfall, \*Erosion, \*Climatic zones, \*Soils, \*Podzols, \*Distribution, \*Seasonal, \*Soil types, \*Foreign research, \*Foreign countries, \*Sri Lanka, \*Erodibility.

Erosivity (R) is a quantitative measure of the erosive power of rainfall. Erosivity as defined by the total kinetic energy of rain falling at intensities greater than 1 in/h (KE greater than 1) was calculated for nine locations which are representative of the different rainfall patterns and soils of Sri Lanka. More than 50% of the total rainfall in the lowlands was erosive, and this proportion decreased with increasing elevation. In the uplands, less than 25% of the total rainfall was erosive. In the wet zone, southwest monsoon rains were more erosive than the northeast monsoon rains. Rainfall intensities up to 4 in/h are experienced throughout the country. Average annual erosivity values range from 78,100 ft-ton/acre in the dry zone. Erodibility (K) of different soils in Sri Lanka was estimated, using the nomograph developed by Wischmeier, et al, to assess the relative susceptibility of the different soils to erosion. Erodibilities thus calculated varied from 0.17 to 0.48. The relative erosion hazard for the nine locations was assessed by comparing the magnitudes of the factor  $R \times K$ . Experimental evidence suggest that erosivity defined by KE



## Erosion and Sedimentation—Group 2J

greater than 1 may not be appropriate for some soils in Sri Lanka, and the basic infiltration rate of soil may have to be taken into consideration when calculating erosivity. (See also W71-13910) and W78-11113) (Humphreys-ISWS)  
W78-11118

#### METHODS FOR COMPUTATION OF RUNOFF AND SEDIMENT YIELD FROM SLOPES USED FOR AGRICULTURAL NEEDS,

Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).  
N. N. Bobrovitskaya, I. N. Bogolubova, and S. N. Tumanovskaya.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 62-66, July 1977. 2 tab, 6 ref.

Descriptors: \*Runoff, \*Sediment yield, \*Soil erosion, \*Agricultural watersheds, Flood discharge, Design flood, Erosion, Soil types, Land use, Mathematical models, Equations, Analytical techniques, Discharge(Water), Snowmelt, Watersheds(Basins), Foreign countries, Foreign research, \*USSR.

The paper dealt with methods for the computation of water and sediment discharge for hydrological verification of anti-erosion projects. Maximum snowmelt and rainfall flood runoff were computed in accordance with the instructions for computing hydrological characteristics used in the USSR. Soil erosion from slopes was computed from empirical relationships between specific sediment yield and runoff depth. The soil erosion equation contains parameters that take into account runoff processes, the type of rill network on the slopes, soil type, and the type of land use. (See also W78-11113) (Humphreys-ISWS)  
W78-11119

#### THE EFFECT OF EXOGENOUS AND ENDOGENOUS FACTORS ON WATER EROSION DEVELOPMENT IN THE USSR,

Gosudarstvennyi Gidrologicheskii Inst., Moscow (USSR).  
K. N. Lisitsina.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 67-74, July 1977. 5 fig, 15 ref.

Descriptors: \*Sediment discharge, \*Erosion, \*Land use, Rivers, Erosion rates, Forests, Deserts, Regions, Physiographic provinces, Foreign countries, \*USSR, Sediment concentration.

From measurements of suspended sediment discharge on rivers in the European territory of the USSR, Siberia, and Central Asia, an analysis of exogenous and endogenous factors and their effect on erosion was made. The exogenous factors were described according to physiographic zones - 29 erosion areas being studied. Equations for the computation of erosion were obtained for each area. The variation of erosion rates over the study area is governed by the laws of geographical zonality as well as other processes depending on exogenous factors. The effect of endogenous factors on erosion was shown. The ratios of the intensity of endogenous processes to erosion were obtained, and based on these ratios the zones were delimited. (See also W78-11113) (Humphreys-ISWS)  
W78-11120

#### FACTORS INFLUENCING EROSION IN DISPERSIVE CLAY AND METHODS OF IDENTIFICATION,

California Univ., Davis. Dept. of Civil Engineering.  
K. Arulanandan, and R. T. Heinzen.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 75-81, July 1977. 3 fig, 19 ref.

Descriptors: \*Erosion, \*Cohesive soils, \*Reviews, \*Soil erosion, Clays, Laboratory tests, Methodology, Shear stress, Soil physical properties, Erosion rates, Hydrometry, Expansive clays, Evaluation, Dispersion, Erodibility, Critical shear stress.

Recent laboratory studies of the erosive behavior of saturated cohesive soils using quantitative methods such as the rotating cylinder and flume apparatus showed that the mechanism of saturated cohesive soil erosion is basically a complex phenomenon involving the structure of the soil and the nature of the interaction between the pore and eroding fluids at the surface. In the case of partially saturated soils, erosion is accelerated further by a process called slaking. The slaking rate being influenced by the structure of the soil. Qualitative methods such as the dispersion ratio and the pinhole test are considered to be inadequate to evaluate the erosion potential and shear stresses of all soils. Relationships between critical shear stress, pore fluid composition, and type and amount of clay characterized by the magnitude of dielectric dispersion or cation exchange capacity were presented for the prediction of erosion potential. In the case of dispersive clays, the potential use of free swell tests as a method of evaluation was examined. It was considered that a gross quantitative evaluation of erosive behavior can best be carried out using the rotating cylinder or a flume, using the loss in weight as a measure of erosion. (See also W78-11113) (Humphreys-ISWS)  
W78-11121

#### SEDIMENT YIELD AS A FUNCTION OF CLIMATE IN UNITED STATES RIVERS,

L. Wilson.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 82-92, July 1977. 5 fig, 2 tab, 4 ref.

Descriptors: \*Sediment yield, \*Rivers, \*Climates, \*Model studies, \*United States, Sediments, Theoretical analysis, Analytical techniques, Sediment discharge, Weather, Watersheds(Basins), Runoff, Graphical methods, Precipitation(Atmospheric), Curves, Hydrographs, Water yield, Sedihydrogram.

The complex climatic controls of sediment yield were evaluated through statistical and graphical analysis of long-term sediment discharge and weather records from 100 drainage basins throughout the United States and additional analysis of 1,400 basins where the data base is less good. The fluvial regimes of the streams studied can be represented on a sedihydrogram (SHG). The SHG is a double-logarithmic grid on which mean monthly sediment yield is plotted against mean monthly water yield. Although the techniques required have not been developed as yet, it should be possible to construct an SHG for almost any stream, even where data are deficient, especially if the general shape of the SHG can be determined for a gauged stream within the same climatic regime. The SHG will facilitate design of data-gathering programs and subsequent analysis of sediment transport curves and sediment transport curves and sediment yield variations. (See also W78-11113) (Humphreys-ISWS)  
W78-11122

#### SEDIMENT YIELD IN RELATION TO DRAINAGE BASIN CHARACTERISTICS IN SOME INDIAN RIVER VALLEY PROJECTS,

Council of Scientific and Industrial Research, New Delhi (India).  
V. B. Lal, S. Banerji, and J. Narayanan.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 93-97, July 1977. 1 fig, 2 tab, 4 ref.

Descriptors: \*Sediment yield, \*Watersheds(Basins), \*Reservoir silting, \*Estimating, Analytical techniques, Analysis, Mathematical models, Sedimentation, Reservoirs, Foreign research, Foreign countries, \*India, Silt index.

Besides climate, geological factors, soil cover characteristics, and natural and artificial activity leading to abrupt changes in erosion, the most significant factors for sediment yield are geomorphological characteristics of the contributing basin including its area, and the rates of flow of water. With a view to making realistic estimates of sedimentation, particularly for the reservoir projects for which data are not available, the rate of sedimentation was studied for five north Indian reservoirs, lying along the sub-Himalayan belt and in the Indo-Gangetic plain. It was assumed that the characteristics of geology, soil cover, and human activity are comparable for these reservoirs. The rate of sedimentation was defined as a silt index, i.e., the annual rate of sediment yield per unit area. In an earlier paper, the relationship  $S = f(C/I, I/A)$  was investigated where  $C/I$  is the capacity-inflow ratio, and  $I/A$  is the average annual inflow per unit area. Two more relationships investigated introduced separately two geomorphological terms, viz., the area of the basin,  $A$ , and the basin relief ratio,  $R$ . It was shown that the introduction of these terms does not improve the relationship as obtained earlier so far as the north Indian region is concerned. However, for two dams outside the selected region, viz., the Tungbhadra, and the Nizamsagar, the present equations incorporating the geomorphological parameters  $A$  and  $R$  give values within + or - 30% of the reported values, whereas the earlier equation was inapplicable for other regions widely differing in geological and hydrological characteristics. This is, however, not to suggest at this stage and with the extent and the nature of the data presently available, that the equations can be legitimately applied to any regions other than north India. (See also W78-11113) (Humphreys-ISWS)  
W78-11123

#### ESTIMATION OF SEDIMENT YIELD IN TEMPERATE ALPINE ENVIRONMENTS,

British Columbia Univ., Vancouver. Dept. of Geography.  
O. Slaymaker.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 109-117, July 1977. 2 tab, 47 ref.

Descriptors: \*Sediment yield, \*Suspended load, \*Mathematical models, \*Estimating equations, Analytical techniques, Reviews, Rivers, Estimating, Climatic zones, Alpine, Temperate, Erosion, Geomorphology, Watersheds(Basins), Alpine environments.

Sediment yield data, based on dissolved and suspended river loads, and measurements of geomorphic processes at sites in temperate alpine environments were compared critically. Measurements of rates of operation of slope processes, where integrated over a drainage basin, are 1 to 2 orders of magnitude smaller than sediment yield. The relationship between sediment yield and primary denudation was discussed, and ways of estimating sediment yield were seen to suffer from a blurring of this distinction. The estimation of sediment yield in temperate alpine environments was discussed in terms of glacierization, lithology, sediment availability, and mean runoff. (See also W78-11113) (Humphreys-ISWS)  
W78-11125

## Field 2—WATER CYCLE

### Group 2J—Erosion and Sedimentation

#### THE EFFECT OF FARMING UPON SOLID TRANSPORT IN THE RIVER ALMOND, SCOTLAND.

Baghdad Univ. (Iraq). Dept. of Geology. N. A. Al-Ansari, M. Al-Jabbari, and J. McManus. In: Erosion and Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 118-125, July 1977. 7 fig, 1 tab, 9 ref.

Descriptors: \*Sediment discharge, \*Land use, \*Watersheds(Basins), \*Agriculture, Sediment transport, Suspended load, Crops, Discharge(Water), On-site data collections, Analysis, Analytical techniques, Hydrographs, Foreign research, Foreign countries, \*Scotland, \*River Almond(Scotland), Sediment concentration.

The River Almond, a right bank tributary of the River Tay, Scotland, drains a 176 sq km basin situated mainly on Lower Old Red Sandstones of Devonian age, but straddling the major Highland Boundary Fault, so that the uppermost sectors drain Dalriadan metamorphic slates and associated schistose sediments. The area is mainly open moorland (79%) with restricted areas of afforestation (6%) while agriculture is limited to the floors of the main valleys (15%). The mean daily river discharge is 4.1 cu m/s and records dating from 1972 show maximum flows of 82.6 cu m/s and minimum flows of 0.48 cu m/s. Few sand-dominant reaches exist above the confluence with the Tay, and pebbles and cobbles dominate the bed at the Almondbank gauging station. The pebbles and cobbles preclude the use of VUV or similar bed load samplers for direct measurement of bed load. Direct methods of suspended sediment load calculation show that in a wet year (e.g., 1974), 15,817 tons pass seawards, while in a dry year (e.g., 1973), only 4,780 tons pass the gauging station. The annual sediment yield calculated for the 176 sq km basin is 90.4 tons/sq km in a wet year, falling to 27.2 tons/sq km in a dry year. These figures are about half the values obtained for the nearby River Earn for a larger basin on softer rocks and dominated by farmland (126 tons/sq km and 67.3 tons/sq km). Continuous recording of suspended sediment concentrations in transit, obtained using a Partech recording siltmeter giving readings at 0.5-s intervals, has confirmed that suspension concentrations initially increase as discharge rises, but that dilution soon follows. The suspended sediment load transport peak generally precedes peak river discharge, especially during early winter flows. Later in the year the two peaks more closely coincide or reverse their relative positions. Irregularities in the record, such as a steady rise in suspended sediment load while runoff is constant, are related to local agricultural practices. (See also W78-11113) (Humphreys-ISWS) W78-11126

#### THE REGIME OF THE SUSPENDED SEDIMENT YIELD IN THE RIVERS TO LAKE CHAD: SUMMARY OF STUDIES BY ORSTOM IN THE REPUBLIC OF CHAD (REGIME DES APPORTS FLUVIATILES DE MATERIAUX SOLIDES EN SUSPENSION VERS LE LAC TCHAD: SYNTHÈSE DES ÉTUDES DE L'ORSTOM EN REPUBLIQUE DE TCHAD).

Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de N'Djamena. A. Chouret.

In: Erosion and Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 126-133, July 1977. 4 fig, 6 ref.

Descriptors: \*Sediment discharge, \*Suspended load, \*On-site investigations, \*Africa, Sediment yield, Rivers, Foreign countries, Foreign research, Erosion, Watersheds(Basins), Measurement, Methodology, Data collections, Sediments, Hydrographs, Discharge(Water), \*Chad, \*Lake Chad.

Because of the very unusual physical and climatic features in the Lake Chad basin, ORSTOM conducted a study of the suspended load in the main tributaries feeding the lake. The measurements continued for a period of several years and were within the framework of a multidisciplinary study. The suspended sediment yield in the rivers was measured (1) at latitude 8 deg 30 min N, which roughly delineates the zone of erosion for the stations which are hydrologically significant for Lake Chad, and (2) at N'Djamena 12 deg N, to ascertain the separate yields for each river and the total yield for the basin of 600,000 sq km. After establishing the methodology, the sediment discharges at the stations were determined from a statistical analysis of the accuracy of the measurements and their density. The observations period (1969-1974) covered a range of flows from the relatively high flows in 1970, which resulted in floods in the Logone basin, to the exceptionally low flows in 1972 and 1973: on the whole corresponding to a period of low flow. The suspended sediment load to the lake is steady, and the basic data for each basin are found to be uniform, particularly so for sediment concentration. The Logone basin is shown to have an individual character with reference to the Chari basin. A trend of decreasing erosion in the upstream basins from west to east was noticed. The role of the flood plains which are characteristic of the Chad basin appears to be significant. (See also W78-11113) (Humphreys-ISWS) W78-11127

#### SUSPENDED LOAD IN CAMEROUN (TRANSPORTS SOLIDES EN SUSPENSION AU CAMEROUN).

Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de Yaounde. J. C. Olivry.

In: Erosion and Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 134-141, July 1977. 6 fig, 2 tab.

Descriptors: \*Sediment discharge, \*Suspended load, \*Watersheds(Basins), \*Africa, Erosion, Measurement, On-site investigations, Data collections, Foreign research, Foreign countries, Rivers, \*Cameroun, Sediment concentration.

Since 1966, ORSTOM hydrologists have been using a simple methodology to measure suspended load in Cameroun. This has enabled a precise study to be made of the transport regime in three large basins: the Sanaga at Nachtigal, the Mbam at Gaura and the Tsanga at Bogo. For the Sanaga basin, the specific annual degradation is 28 tons/sq km, and that for the Mbam basin is between these two basins is explained by the importance of agriculture in the Bamileke district. Six million tons of sediment are transported to the ocean each year. For the Tsanga basin at Bogo in north Cameroun, the specific degradation reaches 210 tons/sq km/yr, and the average annual concentration is between 1,000 and 1,600 g/cu m. The amount of suspended sediment transported from the Tsanga to the Yaere is about 300,000 tons/year. The erosion in Cameroun occurs mainly in the wet season and is highly dependent on soil and vegetative cover. (See also W78-11113) (Humphreys-ISWS) W78-11128

#### TRANSPORT OF BED LOAD AND SUSPENDED LOAD BY RIVERS FROM LOW RAINFALL AREAS IN AFRICA.

British Columbia Univ., Vancouver. P. R. B. Ward.

In: Erosion and Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 142-148, July 1977. 4 fig, 3 tab, 4 ref.

Descriptors: \*Sediment discharge, \*Rivers, \*Africa, Sediment yield, Suspended load, Bed load, Surveys, Discharge(Water), On-site investigations, Watersheds(Basins), Foreign countries, Foreign research, Analytical techniques, \*Rhodesia, Sediment concentration.

Sediment yields from two basins in Rhodesia were compared. Large differences were found in the sediment yields from these basins because of differences in the hydrology and in the geology, although only a small difference exists in the mean annual rainfall. (See also W78-11113) (Humphreys-ISWS) W78-11129

#### SEDIMENT TRANSPORT IN THE HOPE RIVER, JAMAICA: A TROPICAL DRAINAGE BASIN CHARACTERIZED BY SEASONAL FLOW.

University of the West Indies Kingston (Jamaica). Dept. of Geology. P. A. Wood.

In: Erosion and Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 149-156, July 1977. 6 fig, 20 ref.

Descriptors: \*Sediment discharge, \*Tropical regions, \*Watersheds(Basins), \*Hydrographs, Suspended solids, Suspended load, Sediment transport, Bed load, Seasonal, Flow, Streamflow, Discharge(Water), Floods, Rating curves, Foreign research, Rivers, \*Jamaica, \*Hope River(Jamaica), Sediment concentration, Rating stage, Falling stage.

The Hope River, Jamaica, is characterized by periodic high magnitude floods and seasonal flow. A general relationship of suspended sediment concentration to discharge indicates that concentrations of over 60,000 mg/l may be expected, with discharges of 20 cu m/s. Suspended sediment concentrations are higher for the same discharge during the rising stage of the hydrograph than during the falling stage, and data from individual rating loops indicate that over 8,000 tons of suspended sediment have been lost in just over 30 h. Competence determinations for bed material transport suggested that for the Hope River, D and 2D/3 are poor approximations for R, and that very large material (over 400 mm) is capable of being transported during high magnitude events. (See also W78-11113) (Humphreys-ISWS) W78-11130

#### RELATIONSHIP BETWEEN SOIL EROSION AND SEDIMENT DELIVERY.

Agricultural Research Service, Beltsville, MD.

A. R. Robinson.

In: Erosion and Solid Matter Transport In Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 159-167, July 1977. 3 tab, 18 ref.

Descriptors: \*Soil erosion, \*Sediment yield, \*Reviews, \*United States, Erosion, Sheet erosion, Channel erosion, Gully erosion, Stream erosion, Deposition(Sediments), Valleys, Sedimentation, Sediment sources.

In the USA, the amount of erosion occurring at an upstream point generally is estimated using the universal soil loss equation (USLE), although other relationships also have been used. The USLE estimates gross erosion, including rill erosion, on an annual basis. It does not predict deposition or compute gully and channel erosion. The sediment delivery ratio is used as a measure of the amount of sediment delivered by a stream system as a ratio of the erosion that has been occurring upstream. The ratio accounts for the sediment losses and gains that occur below the point where gross erosion is determined. The sediment



delivery ratio has been shown to be somewhat related to the size of basin with the ratio decreasing as the size increases. There is a considerable volume of sediment in transit at any time between the point of origin and final deposition. The amount of sediment delivered at some point in the stream or river system is also a function of the soils, total land use (including construction and surface mining), conservation practices, energy ability of the flow to transport the material, density of stream channels, and streambank stability and/or instability. Recent studies on small basins in the USA have shown that conservation practices have reduced upland erosion but have increased streambank instability so that the sediment delivery has remained essentially the same. In this case, the source of sediment carried in the stream shifted from upland agricultural areas to the channel banks. Consideration of all the above factors should result in better estimating procedures for sediment delivery ratios and stream loadings of sediment. (See also W78-11113) (Humphreys-ISWS)

W78-11131

#### SEDIMENT DELIVERY RATIOS DETERMINED WITH SEDIMENT AND RUNOFF MODELS, Agricultural Research Service, Temple, TX. Grassland Forage Research Center. J.R. Williams.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 168-179, July 1977. 5 tab, 16 ref.

Descriptors: \*Sediment yield, \*Model studies, \*Texas, \*Watersheds(Basins), Erosion, Soil erosion, Routing, Analytical techniques, Annual, Mathematical models, Sheet erosion, Sediments, Forecasting, Sediment discharge, Storm runoff, Analysis, Hydrographs, Evaluation, Sediment delivery ratio, Sediment-runoff model, Sediment routing.

The long-term average annual sediment yield from a basin can be predicted by applying a delivery ratio to estimated gross erosion. Average annual sediment yield is the only information required for some problems like sediment pool design for small reservoirs. Applying a delivery ratio to estimated gross erosion is convenient and can be fairly accurate if delivery ratios can be predicted accurately. Traditionally, delivery ratio prediction equations have been developed by relating basin characteristics to measured sediment yield divided by predicted gross erosion. However, prediction equations have been developed for only a few regions of the US because of limited sediment data. By using sediment and runoff models, delivery ratios can be determined for any region for use in developing prediction equations. A sediment-runoff model was used to predict average annual sediment yield from basins with areas up to 65 sq km. A sediment routing technique was used on basins with areas up to 200 sq km to maintain prediction accuracy. The procedure was demonstrated with data from Little Elm Creek basin near Aubrey, Texas. Delivery ratio prediction variables in order of importance were SCS curve number, relief-length ratio, and drainage area. The prediction equation explained about 93% of the variation in delivery ratio. In tests with data from 15 other Texas basins, sheet erosion was computed with the universal soil loss equation and adjusted by the delivery ratio to obtain sediment yield. Sediment yield from gullies was estimated and added to the sheet sediment yield to compare with measured amounts. This procedure explained about 80% of the variation in average annual sediment yield for the 15 basins. Modelling to determine delivery ratios is much faster and less expensive than the traditional method of long-term data collection. (See also W78-11113) (Humphreys-ISWS)

W78-11132

#### A SEDIMENT YIELD INDEX AS A CRITERION FOR CHOOSING PRIORITY BASINS.

All Indian Soil and Land Use Survey, New Delhi. Y. P. Bali, and R. L. Karale.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 180-188, July 1977. 1 fig, 4 tab, 2 ref, 1 append.

Descriptors: \*Sediment yield, \*Forecasting, \*Watersheds(Basins), Mapping, Soil erosion, Erosion rates, Analytical techniques, Foreign countries, Foreign research, Analysis, Data collections, Priorities, \*India, Sediment yield index, Sediment delivery ratios.

In the absence of measured sediment data, a sediment yield index expressing the relative sediment yield from different basins formed the basis for grading the basins in order of priority for soil and water conservation measures. The methodology involves erosion intensity mapping on a base material on which natural units of sub-basins and basins are delineated and codified. The erosion intensity mapping units, based on significant parameters of sediment detachment, reflect the relative magnitude of sediment yield expressed as a weighting value. A basic factor  $K = 10$  signifies a delicate balance between the different processes of sediment detachment and deposition in a particular unit. Addition of (x) and K is indicative of effect sediment detachment somewhat proportional to the value of x. Subtraction from K suggests deposition. The transport of sediment is estimated using a delivery ratio which is based on the intricate interrelationship of site and soil factors. Following this methodology, demarcation of priority basins has been accomplished for the whole or part of the 12 River Valley Projects covering a total area of about 5.5 million ha. Comparisons with the sediment yield predictive equation showed fairly dependable correlations with the weighting values of erosion intensity units. (See also W78-11113) (Humphreys-ISWS)

W78-11133

#### BASIN SEDIMENT YIELD MODELLING USING HYDROLOGICAL VARIABLES,

Queens Univ., Kingston (Ontario). Dept. of Geography.

C. A. Onstad, and A. J. Bowie.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 191-202, July 1977. 4 fig, 5 tab, 17 ref.

Descriptors: \*Sediment yield, \*Forecasting, \*Watersheds(Basins), \*Model studies, \*Iowa, \*Mississippi, Mathematical models, Demonstration watersheds, Analysis, Data collections, Gully erosion, Rill erosion, Sheet erosion, Equations, Universal soil loss equation, Sediment sources, Sediment delivery ratios.

Estimates of sediment yields from basins and prediction of sediment sources are needed increasingly throughout the world for use in designing practices to conserve soil and control pollution. Sediment yield models incorporating hydrological and hydraulic flow properties are useful in this respect. Models with these characteristics have been designed to predict sediment yields from single storms to monthly and annual yields. Models of this type also can be used to predict sediment sources within basins. Three models for predicting yields from single storms were compared. One model provides estimates of the magnitude of the sediment sources on the basin which give planners an index of areas where conservation measures are most critically needed. (See also W78-11113) (Humphreys-ISWS)

W78-11134

#### EROSION PROCESSES IN MOUNTAIN BASINS IN HUMID REGIONS,

National Research Center for Disaster Prevention,

Tokyo (Japan).

T. Mizutani.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 203-208, July 1977. 4 fig, 2 ref.

Descriptors: \*Mass wasting, \*Watersheds(Basins), \*Model studies, \*Sediment yield, Mountains, Sediment discharge, Humid areas, Erosion, Mathematical models, Scour, Theoretical analysis, Analytical techniques, Tractive forces, Sediment load, On-site investigations, Running waters, Foreign research, \*Japan, Erosion processes.

Theoretical equations which represent the changes in the longitudinal profiles of mountain slopes and valleys were derived from consideration of the simplified erosional mechanisms of the dominant agents in humid regions. The applicability of the equations of actual processes of erosion was confirmed by using the data obtained mainly from morphometric measurements of erosional landforms. Processes of debris transport in mountain basins with high gradients can be represented by the relation  $Q = c(\tau)^{\alpha}$  to the alpha power, where Q is the amount of sediment discharge, tau the tractive force, c a constant, and alpha varies from 3 to 3.5. (See also W78-11113) (Humphreys-ISWS)

W78-11135

#### THE SEDIMENTS DEPOSITED BY THE OUED MEDJERDAH DURING THE EXCEPTIONAL FLOOD OF MARCH 1973 IN TUNISIA: QUANTITATIVE AND QUALITATIVE ASPECTS OF TRANSPORT AND DEPOSITION (LES ALLUVIONS DEPOSEES PAR L'OUED MEDJERDAH LORS DE LA CRUE EXCEPTIONNELLE DE MARS 1973 EN TUNISIE: ASPECTS QUANTITATIF ET QUALITATIF DUE TRANSPORT ET DU DEPOT),

Office de la Recherche Scientifique et Technique Outre-Mer, Tunis (Tunisia).

J. Claude, and J. Y. Loyer.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 211-218, July 1977. 3 fig, 2 tab, 3 ref.

Descriptors: \*Floods, \*Sediment yield, \*Deposition(Sediments), \*On-site investigations, Sediment transport, Storms, Surveys, Sediments, Analysis, Volume, Foreign countries, Measurement, Alluvial channels, Alluvium, \*Tunisia.

In March 1973, the Oued Medjerdah experienced an exceptional rise which caused serious flooding. The hydrological measurements made during the flood and the assessments of the thickness of the sediments made after the flood had subsided have allowed the volumes of sediment transported and deposited to be estimated. These volumes are considerable. Analyses of a large number of sections of alluvium and of the materials they overlie have served as the basis for a statistical study of the sediments themselves and for the comparison of the new material with the substratum. (See also W78-11113) (Humphreys-ISWS)

W78-11136

#### THE EXTENT OF SILTING IN THE BASINS BEHIND SEVEN DAMS IN TUNISIA AND THE ESTIMATION OF SEDIMENT TRANSPORT (MESURE DE L'ENVASEMENT DANS LES RETENUES DE SEPT BARRAGES EN TUNISIE: ESTIMATION DES TRANSPORTS SOLIDS),

Division Ressources en Eau, Tunis (Tunisia).

A. Ghorbel, and J. Claude.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; July 1977. 5 fig, 3 tab, 6 ref.

## Field 2—WATER CYCLE

### Group 2J—Erosion and Sedimentation

Descriptors: \*Reservoir silting, \*Sediment yield, \*Demonstration watersheds, \*Surveys, Sediment transport, Estimating, On-site investigations, Siltation, Volume, Measurements, Methodology, Analytical techniques, Foreign research, Foreign countries, Deposition(Sediments), Reservoirs, Sediments, Erosion.

Inspection of basins behind dams for silting on the one hand, allows, evaluation of the effectiveness of counter measures and, on the other, because of the deposition of sediments over a long period, it leads to estimates of the total sediment transport and erosion from experimental basins. A systematic program for the measurement of these factors was carried out in Tunisia in 1975 and 1976 using a high resolution echo sounder to measure the depths along previously surveyed profiles. The volume of sediment laid down leads to an estimation of the total solid transport reaching the basins and the specific erosion in the seven experimental basins. The results vary from one basin to another, but they provide ample evidence that erosion and sediment transport reach considerable proportions; and they lead to several comments on the representativity of the measurements. (See also W78-11113) (Humphreys-ISWS) W78-11137

**PIPING IN THE MILK RIVER CANYON, SOUTHEASTERN ALBERTA-A CONTEMPORARY DRYLAND GEOMORPHIC PROCESS,** Queens Univ., Kingston (Ontario). Dept. of Geography.

R. W. Barendregt, and E. D. Ongley.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 233-243, July 1977. 8 fig, 7 ref.

Descriptors: \*Gullies, \*Geomorphology, \*Erosion, \*Canada, Surveys, Sediment transport, On-site investigations, Headward erosion, Gully erosion, Canyons, Semiarid climates, Channels, Underground, Sinks, \*Alberta, \*Milk River Canyon, \*Piping phenomena(Soils).

During the spring and summer of 1975 and 1976, the authors observed and recorded piping phenomena as it affects slope development in the Milk River Canyon area of semiarid southeastern Alberta. This little-studied and seldom-described geomorphological process was illustrated amply and occurs on a scale not previously described in Canada or elsewhere. Piping is responsible for a sequence of landscape forms which, together, cause canyon wall retreat. A small dam built at the outlet of a representative pipe network provided a rough estimate of 286 tons of sediment per sq km of canyon wall in the one field season. Factors favorable to piping occur in the Milk River Canyon area. They are: (1) the presence of swelling clays, especially bentonite (a devitrified volcanic ash); (2) the abundance of fine-grained sediments; (3) the presence of soft unconsolidated bedrock as well as alluvium; (4) large zones of porous material alternated with impermeable members; (5) long, hot dry spells with episodic intense precipitation; (6) active badland erosion; (7) incised gullies and a degrading river; (8) sparse vegetation; (9) high local relief producing a steep hydraulic gradient; and (10) the presence of seasonally large hydraulic heads provided by the sloughs on the prairie surface above the canyon walls and by the thick porous sandstones which rest on an impermeable clayey carbonaceous shale and lignite. (See also W78-11113) (Humphreys-ISWS) W78-11138

**STREAM DISCHARGE, SUSPENDED SEDIMENT AND EROSION RATES IN THE RED DEER RIVER BASIN, ALBERTA, CANADA,** Alberta Univ., Edmonton. Dept. of Geography. I. A. Campbell.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 244-259, July 1977. 2 fig, 6 tab, 45 ref.

Descriptors: \*Watersheds(Basins), \*Canada, \*Suspended load, \*Rivers, Sediment load, Streamflow, Discharge(Water), On-site investigations, Data collections, Arid climates, Semiarid climates, Erosion, Sediment yield, Rating curves, Foreign research, Foreign countries, \*Alberta, \*Red Deer River.

The study of the relationship between stream discharge and sediment load and regional erosion rates in arid and semiarid environments is greatly complicated by the fact that fluvial activity within the drainage basins of such areas is concentrated in perhaps one or two events each year. Such patterns of fluvial activity present a major problem when attempting to estimate suspended sediment rating curves. In most humid drainage basins, much of the sediment load originates with fluvial processes initiated by precipitation, or runoff, over large areas of the basin. High discharges usually are associated with large sediment loads. Under arid and semiarid climates, such situations are rare. Here, intense local convective rainstorms, often falling on poorly vegetated and highly erodible material close to the channel system, result in large inputs of sediment often accompanied by relatively minor changes in discharge in the main channel. This additional factor further complicates the problem and highlights the general fact that in most drainage systems, in reality, the sediment yield is derived from a relatively small proportion of the total catchment area. In regions of moisture deficiency, such a situation almost always pertains. These patterns were illustrated by data collected from the Red Deer river basin, Alberta, Canada. Suspended sediment and stream discharge data, as related to surface erosion measurements and regional erosion rates, showed that typical rating curves significantly underestimate the occurrence of high sediment concentrations and that in most years the sediment concentrations greatly exceed those computed by rating curves. Such a situation poses potentially severe problems in terms of design criteria for river management projects, especially in the arid world. (See also W78-11113) (Humphreys-ISWS) W78-11139

**EROSION MODALITIES IN THE LOWER BASIN OF THE OUED ELHADJEL (CENTRAL TUNISIA) (CAUSES ET MODALITES DE L'EROSION DANS LE BASSIN VERSANT INFÉRIEUR DE L'OUED EL-HADJEL (TUNISIE CENTRALE),**

Office del Recherche Scientifique et Technique Outre-Mer, Tunis (Tunisia). J. Bonvallot, and A. Hamza.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 260-268, July 1977. 2 fig, 3 tab, 6 ref.

Descriptors: \*Reservoir silting, \*Watersheds(Basins), \*Erosion, \*Land use, Dams, Data collections, Rivers, On-site investigations, Foreign countries, Foreign research, Grazing, Sheet erosion, Exploitation, \*Tunisia, Sediment sources.

The authors presented some erosion data for the lower sub-basin of the Oued El-Hadjel, in Central Tunisia. The erosion phenomena are due to excessive agricultural exploitation, intense deforestation to provide charcoal, and overgrazing. Modalities of erosion were analyzed. It was concluded that anti-erosion measures are absolutely necessary to avoid rapid silting in the future barrage at Sidi Sand. (See also W78-11113) (Humphreys-ISWS) W78-11140

**SUSPENDED-LOAD DISCHARGE IN THE SEMIARID REGION OF NORTHERN PERU,** Rhein-Main-Donau A. G., Munich (West Germany). J. Burz.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 269-277, July 1977. 3 fig, 5 tab.

Descriptors: \*Suspended load, \*Sediment discharge, \*Rivers, \*Semiarid climates, Climates, Discharge(Water), Sampling, On-site investigations, Analytical techniques, Analysis, Foreign countries, Foreign research, Data collections, Equations, \*Peru, \*Rio Chira, \*Rio Chancay, \*Rio Jequetepeque, Sediment concentration.

The outstanding characteristic of hydrological processes in semiarid regions is their variability. This effects above all the bed-load and suspended-load discharge. This paper dealt with the variations of the water and suspended-load discharge of three rivers in the north of Peru. The relationships between water discharge and suspended-load concentration and suspended-load discharge were investigated by means of regression and correlation analysis. The results showed that the degree of association is relatively high except for years with a very low correlation coefficient. The marked variations between the seasons of the year require segregation of data by seasons. The combination of hydrological factors common in dry seasons may be virtually nonexistent during wet seasons. A particular combination of factors may exist for only a few days in several years and may render computations based on average values grossly erroneous. The high altitude zone is the only part of the basin in which precipitation is received regularly. Therefore, water and sediment discharge values expressed as discharge per square kilometre (yield) should be used with caution. The transfer of these results to other basins cannot be recommended because the physical characteristics of individual basins are different. The available data are not suitable for frequency and probability studies. (See also W78-11113) (Humphreys-ISWS) W78-11141

**EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS WITH REFERENCE TO THE NILE BASIN,**

Ministry of Irrigation, Cairo (Egypt). Water Research Center. M. S. E. Shalash.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; July 1977: International Association of Hydrological Sciences Publication No. 122, p 278-283, July 1977. 1 fig, 2 tab.

Descriptors: \*Watersheds(Basins), \*Rivers, \*Suspended load, \*Sediment discharge, Erosion, Sediment yield, Sediment transport, Soil erosion, Foreign countries, Foreign research, On-site data collections, Sediments, Gravels, Sands, Silts, Clays, \*Nile River.

The River Nile catchment covers an area of 2,900,000 sq km, extends from latitude 4 deg S to latitude 31 deg N, and experiences a great variety of climate. The vegetation within the Nile basin includes alpine flora in the higher parts, dense tropical forest, tall elephant grass, thin savanna forest, thick vegetation of tropical swamps, thorny forest, and scanty vegetation of desert country. Also, there are dense crops grown on irrigated lands. In general, the Nile basin may be divided into four main sub-basins: (1) The White Nile, whose headwaters rise south of the equator. Its runoff is 29% of the total Nile runoff and its water is clear. (2) The Atbara River which rises in north Ethiopia. This is a flashy river and is dry for half the year. Its runoff is muddy and constitutes 14% of the total Nile runoff. (3) The Blue Nile which also rises in north Ethiopia. Its runoff equals 57% of the total runoff of the Nile. The flow is muddy dur-

ing the rainy season. (4) The Main Nile which flows northwards to the sea. Within the Nile basin there are only two main catchment areas; the Blue Nile and Atbara River, which erode and supply the Main Nile with suspended sediment. The average annual suspended sediment load measured in the Main Nile is 134 million tons. The total sediment derived from rainstorms over the Eastern Desert of Egypt amounts to 1 million tons. As there are no direct measurements of the sediment load for the individual basins, it is difficult to estimate the eroded land in each basin separately. The mechanical analysis of the deposited sediment within the main Nile Valley confirms its origin in the eroded surface soil of the Atbara and Blue Nile sub-basins. The rate of annual soil erosion in the Blue Nile and Atbara River basins is about 0.1 mm, and less than that within the main river basin. (See also W78-11113) (Humphreys-ISWS) W78-11142

**A STUDY OF SOLID TRANSPORT DURING A TRADITIONAL MANAGEMENT PROGRAMME USING SURFACE RUNOFF TO NOURISH OLIVE PLANTATIONS IN THE SAHEL REGION OF TUNISIA (CONTRIBUTION A L'ETUDE DES TRANSPORTS SOLIDES DANS UN AMENAGEMENT TRADITIONNEL D'UTILISATION DES EAUX DE RUISSELLEMENT POUR L'ALIMENTATION DES PLANTATIONS D'OLIVIERES DANS LA REGION DU SAHEL DE TUNISIE).**

Centre de Recherche de Genie Rural, Tunis (Tunisia).  
Z. Chabouni.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 284-291, July 1977. 4 fig, 2 tab, 3 ref, 1 append.

Descriptors: \*Africa, \*Surface runoff, \*Sediment transport, \*Watersheds(Basins), Sediment yield, On-site investigations, Rainfall intensity, Rainfall, Sheet erosion, Soil erosion, Suspended load, Suspended solids, Sediments, Clays, Sands, Foreign research, Foreign countries, Hydrologic aspects, \*Tunisia, \*Sahel region(Tunisia).

A traditional hydrological study called 'Meskat' using water from surface runoff to nourish olive plantations, is being carried out in the Sahel region of Tunisia. The results of the first measuring program in 1975-1976 yielded the following erosion data: solid transport in the surface runoff on a catchment takes place in such a way that particles of clay and coarse sand are selected at the cost of loam. Erosion increases sharply with slope. The solid transport load depends on the maximum intensity of the rainfall, the slope of the regression rising with the slope of the basin. Erosion caused by surface runoff occurs when the maximum intensity of rainfall exceeds a certain limit. (See also W78-11113) (Humphreys-ISWS) W78-11143

**THE EFFECTS OF HYDRAULIC CONSTRUCTIONS ON SOLID TRANSPORT IN NORTH AFRICA (EFFETS SUR LES TRANSPORTS SOLIDES DES OUVRAGES HYDRAULIQUES EN AFRIQUE DU NORD).**

Office de la Recherche Scientifique et Technique Outre-Mer, Tunis (Tunisia).  
J. Colombani.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publications No. 122, p 295-300, July 1977. 1 fig, 2 tab, 3 ref.

Descriptors: \*Reservoir silt, \*Deposition(Sediments), \*Sediment yield, \*Africa, Lakes, On-site investigations, Surveys, Measurement, Reservoirs, Flood plains, Hydraulic structures, Soil erosion, Foreign countries, Foreign research, Dams, Semiarid climates, Watersheds(Basins).

The silting up of artificial lakes is one of the most important problems of dam engineers. By their very presence, dams unquestionably modify the solid transport regime downstream, in some cases causing a resumption of erosion. Existing artificial lakes are without doubt the best means of estimating the hazards of sedimentation. Measurements from the Nebeur Reservoir on the Mellegue River were given as an example. Lastly, the possible effects of hydraulic constructions on flood plains and on the marine environment were mentioned. These phenomena are particularly emphasized in North Africa because of the irregular nature of its semiarid climate and the intensity of erosive forces. (See also W78-11113) (Humphreys-ISWS) W78-11144

**SEDIMENTOLOGICAL ASPECTS OF WITHDRAWING WATER FROM RIVERS, Waterloopkundig Lab., Delft (Netherlands).**  
For primary bibliographic entry see Field 4D. W78-11145

**PROBLEMS OF SEDIMENT CONTROL AT AN INTAKE STRUCTURE ON THE HABLE-RUD RIVER AND ITS INFLUENCE ON THE SEDIMENT REGIME OF THE RIVER.**

Water Resources Research Inst., Tehran (Iran).  
For primary bibliographic entry see Field 4D. W78-11146

**A CRITERION FOR DEPOSITION (UN CRITERE DE DEPOT).**  
Ecole Polytechnique Federale de Lausanne (Switzerland). Lab. d'hydraulique.  
G. Pazio.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 325-329, July 1977. 3 fig, 2 tab, 5 ref.

Descriptors: \*Deposition(Sediments), \*Rivers, \*Sediment transport, \*Mathematical models, Model studies, Analytical techniques, Hydraulics, Flow, Stream erosion, Foreign research, Movement, Tractive forces, Silting, Sedimentology, Deposition criteria, Two-phase flow.

In river hydraulics it is more difficult to predict for different flow conditions the deposition of the transported material than the erosion. Erosion criteria are presently well established; on the other hand, hydraulic criteria for sediment deposition are scarce or non-existent. From direct experimental observation of the deposition phenomenon and using independent variables, especially shear stress, a quantitative evaluation method has been established by considering hydraulic conditions of two-phase flows. The results are encouraging and show the possibility using a relationship based on the Shield's function, which is a well accepted criterion for the erosion phenomenon, for the deposition. (See also W78-11113) (Humphreys-ISWS) W78-11147

**SEDIMENT PROBLEMS AT INTAKES FOR HYDROPOWER PLANTS,**  
Uttar Pradesh Irrigation Research Inst., Roorkee (India).  
For primary bibliographic entry see Field 8B. W78-11148

**A NEW TYPE OF INTAKE STRUCTURE SUITABLE FOR ARID CONDITIONS,**  
Technische Univ., Darmstadt (West Germany).  
Inst. fuer Wasserbau und Wasserwirtschaft.  
For primary bibliographic entry see Field 4D. W78-11149

**SEDIMENT PROBLEMS RELATED TO INCREASED DISCHARGES AT THE INTAKE OF A RUN-OF-RIVER CANAL SYSTEM IN HARYANA (INDIA),**  
Office of the Chief Engineer, Chandigarh (India).  
Irrigation Works.  
For primary bibliographic entry see Field 4D. W78-11150

**THE RECENT HISTORY OF PRODUCTIVITY IN SELECTED BERKSHIRE LAKES,**  
Massachusetts Univ., Amherst. Dept. of Zoology.  
For primary bibliographic entry see Field 5C. W78-11203

**MODELING SEDIMENT MOVEMENT IN THE TURBIDITY MAXIMUM OF AN ESTUARY,**  
Virginia Inst. of Marine Science Gloucester Point.  
For primary bibliographic entry see Field 2L. W78-11213

**FACTORS INFLUENCING EQUILIBRIUM OF A MODEL SAND BEACH,**  
Texas A and M Univ., College Station. Dept. of Oceanography; and Texas A and M Univ., College Station. Ocean Engineering Program.  
For primary bibliographic entry see Field 2L. W78-11221

**DETAILED BATHYMETRY OF SELECTED AREAS OF THE INNER CONTINENTAL SHELF OF THE VIRGINIAN SEA: SOUTHEASTERN VIRGINIA, VIRGINIA BEACH AND VACHAPREAGUE, VIRGINIA,**  
Virginia Inst., of Marine Science, Gloucester Point.  
For primary bibliographic entry see Field 2L. W78-11225

**GEOCHEMISTRY OF THE MATTOLE RIVER OF NORTHERN CALIFORNIA,**  
Geological Survey, Menlo Park, CA. Water Resources Div.  
For primary bibliographic entry see Field 2K. W78-11255

## 2K. Chemical Processes

**INTERACTION BETWEEN BEDROCK AND PRECIPITATION AT TEMPERATURES CLOSE TO 0C,**  
Oslo Univ. (Norway). Dept. of Geology.  
H. G. Rueslatten, and P. Jorgensen.  
Nordic Hydrology, Vol 9, No 1, p 1-6, 1978. 3 fig, 2 tab, 8 ref.

Descriptors: \*Snowmelt, \*Melt water, \*Bedrock, \*Water chemistry, Chemical analysis, Ions, Cations, Sodium, Calcium, Magnesium, Potassium, Acids, Acidic water, Humus, Rocks, Leaching, Weathering.

After a long period of snow melting and leaching, samples of snow and meltwater were collected. Chemical analysis revealed that the water composition changed radically during flow across the bedrock surface, even at low temperatures (0-2C). A rapid increase in proton content occurred while the water was flowing along the bedrock/humus interface, followed by a rapid decrease and an equivalent increase in the content of Na(+), Ca(++) , Mg(++), and K(+). The proton content was attributed to proton producing reactions in the vegetation and in the humic laer, while the other cations were supposed to originate from the bedrock surface. Data for water samples collected in August illustrated the influence of higher temperature upon biological processes and the rate of weathering. Water in fractures has high electrolyte content due to long contact time. Scanning electron photomicrographs of the bedrock surface



## Field 2—WATER CYCLE

### Group 2K—Chemical Processes

revealed that distinctive etch pits were developed on the feldspar surfaces due to the weathering effects of the acid water. (Sims-ISWS)  
W78-10527

**WATER QUALITY RESEARCH IN NEW ZEALAND 1976**, National Water and Soil Conservation Organization, Christchurch (New Zealand).  
For primary bibliographic entry see Field 5G.  
W78-10531

**TRACE METAL CONCENTRATIONS IN SOME ICELANDIC SEAWEEDS**, Slovenska Akademija Znanosti in Umetnosti, Ljubljana (Yugoslavia). Biological Inst.  
For primary bibliographic entry see Field 5A.  
W78-10581

**SOIL NITRATE-NITROGEN DETERMINED BY CORING AND SOLUTION EXTRACTION TECHNIQUES**, Agricultural Research Service, Lafayette, IN.  
For primary bibliographic entry see Field 2G.  
W78-10592

**STABILIZATION OF CALCIUM BY SURFACE CHARGE VARIATION IN AN OXISOL**, California Univ., Davis. Dept. of Soils and Plant Nutrition.  
For primary bibliographic entry see Field 2G.  
W78-10594

**AN ALKALINE OXIDATION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN SOILS**, Iowa State Univ., Ames. Dept. of Agronomy.  
For primary bibliographic entry see Field 2G.  
W78-10596

**RELATIONSHIPS BETWEEN SOIL UREASE ACTIVITY AND OTHER SOIL PROPERTIES**, Iowa State Univ., Ames. Dept. of Agronomy.  
For primary bibliographic entry see Field 2G.  
W78-10600

**ON THE CHEMICAL FOUNDATION OF THE SODIUM ADSORPTION RATIO**, California Univ., Riverside. Dept. of Soil and Environmental Sciences.  
For primary bibliographic entry see Field 2G.  
W78-10608

**ION EXCHANGE REACTIONS IN NONDRIED CHAMBERS MONTMORILLONITE HYDROXY-ALUMINUM COMPLEXES**, Minnesota Univ., St. Paul. Dept. of Soil Science.  
For primary bibliographic entry see Field 2G.  
W78-10611

**EVALUATION OF SOIL NITROGEN MINERALIZATION POTENTIALS UNDER MODIFIED FIELD CONDITIONS**, Agricultural Research Service, Durant, OK. Water Quality Management Lab.  
For primary bibliographic entry see Field 2G.  
W78-10613

**EFFECT OF REDOX POTENTIAL AND PH ON THE UPTAKE OF CADMIUM AND LEAD BY RICE PLANTS**, Louisiana State Univ., Baton Rouge. Dept. of Agronomy.  
C. N. Reddy, and W. H. Patrick, Jr.  
Journal of Environmental Quality, Vol. 6, No. 3, p 259-262, July-September 1977. 8 fig, 2 tab, 21 ref.

Descriptors: \*Cadmium, \*Lead, \*Rice, Heavy metals, Sediments, Saturated soils, \*Flooded soils, \*Oxidation-reduction potential, \*Hydrogen ion concentration.

Redox potential and pH are two of the major factors influencing the mobilization and immobilization of heavy metals in flooded soils and sediments, and their availability to plants. A system developed for growing plants in soil suspensions where redox potential and pH can be controlled was used to study the uptake of cadmium (Cd) and lead (Pb) by rice plants. Uptake of Cd and Pb by root and shoot tissue, and their translocation from root to shoot, was determined at six different redox potentials (-200, -100, 0, +100, +200, and +400 mV) and four pH values (5, 6, 7, and 8). The effects of redox potential and pH on the levels of water-soluble Cd and Pb in the soil suspensions were also studied. Almost all Cd entering the rice plants accumulated in the shoots. Total Cd uptake and shoot uptake increased with an increase in suspension redox potential and a decrease in pH. Water-soluble Cd in the soil suspension was significantly correlated with total plant Cd and Cd uptake by shoot. Total Pb uptake, including Pb associated with roots, decreased with an increase in suspension redox potential and pH. (Skogerboe-Colorado State)  
W78-10614

**EFFECT OF INORGANIC AND ORGANIC COMPOUNDS ON THE EXTRACTABILITY OF <sup>239</sup>PU FROM AN ARTIFICIALLY CONTAMINATED SOIL**, California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.  
For primary bibliographic entry see Field 2G.  
W78-10616

**THE ASSESSMENT OF PLANT-AVAILABLE CADMIUM IN SOILS**, Wye Coll., Ashford (England). Dept. of Physical Sciences.  
For primary bibliographic entry see Field 2G.  
W78-10617

**HYDROLOGIC RECONNAISSANCE OF THE YAMPA RIVER DURING LOW FLOW, DINOSAUR NATIONAL MONUMENT, NORTHWESTERN COLORADO**, Geological Survey, Lakewood, CO. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10632

**SOME PROPERTIES OF THE GEOMETRIC MEAN AND ITS USE IN WATER QUALITY STANDARDS**, Geological Survey, Reston, VA. Water Resources Div.  
For primary bibliographic entry see Field 5A.  
W78-10641

**APPROXIMATE ANALYTICAL SOLUTION FOR SOLUTE FLOW DURING INFILTRATION AND REDISTRIBUTION**, New Mexico State Univ., University Park. Dept. of Agronomy.  
For primary bibliographic entry see Field 2G.  
W78-10920

**A TWO-ELEMENT CERAMIC SENSOR FOR MATRIX POTENTIAL AND SALINITY MEASUREMENTS**, Forest Service (USDA), Albuquerque, NM. Rocky Mountain Forest and Range Experimental Station.  
For primary bibliographic entry see Field 2G.  
W78-10921

**WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS**, National Sanitation Foundation, Ann Arbor, MI.  
For primary bibliographic entry see Field 5A.  
W78-10927

**CHEMICAL CHARACTERISTICS OF A DESERT STREAM IN FLASH FLOOD**, Arizona State Univ., Tempe. Dept. of Zoology.  
S. G. Fisher, and W. L. Minckley.  
Journal of Arid Environments, Vol. 1, No. 1, 1978, p. 25-33. 6 fig, 3 illus, 25 ref.

Descriptors: \*Flash floods, \*Water chemistry, \*Floods, \*Peak discharge, Flow characteristics, Arizona, Southwest U.S., Reservoirs, Hydrograph analysis, Nitrates, Phosphates, Flow measurement, Suspended solids.

Flash flooding, a common hydrologic phenomenon in arid regions, has profound physical and biological influences upon receiving systems such as reservoirs. While numerous accounts document the profound effects of desert flash floods upon human settlements, many of which are located upon alluvial fans and debris cones of steep mountains, there is little data available on the transport characteristics of a flash flooding desert stream. This paper reports upon the water chemistry of a single flash flooding event on Sycamore Creek, Arizona, and discusses implications of flash flooding on water resources in desert regions. Water samples were taken before, during and for 2 days after a flash flood event on Sept. 26, 1976. Sample were subsequently analyzed for conductivity, nitrate, phosphate, iron, suspended sediments, organic particulate matter and total alkalinity. Results indicated that particulate materials increase to exceedingly high concentrations during flooding, peaking at the leading edge of the initial flood wave. Total dissolved substances, however, decline regularly during flooding, due to the dilution effect and fail to respond to minor increase in discharge. Some dissolved constituents such as nitrate and phosphate are found to increase with flooding and this suggests that leaching provides a major source of these nutrients. Because of the short-lived nature of these floods, peak discharges seldom exceed 25 percent of the normal flood peaks for the U.S. in general, and flows of less than 10 times the median discharge account for only 7 percent of the total runoff in Sycamore Creek in particular. It is suggested that analysis of flood waters in the Southwestern desert be concentrated on only those peak flows of 10 times the median charge. (Tickes-Arizona).  
W78-10964

**NITRIFICATION IN THREE SOILS AMENDED WITH ZINC SULFATE**, Georgia Univ., Experiment. Dept. of Agronomy.  
D. O. Wilson.  
Soil Biology and Biochemistry, Vol 9, No 4, p 277-280, 1977. 3 fig, 2 tab, 11 ref.

Descriptors: Soils, Soil investigations, \*Zinc, \*Nitrification, Soil properties, Soil chemistry, \*Soil chemical properties, Nitrogen, \*Sulfates.

The introduction of metals into soils by such routes as land application of sewage sludge and the deposition of airborne particulates from mining operations can significantly increase the native soil concentration of these metals. Heavy metals are commonly present in domestic sewage sludge at rather high concentrations and often at extremely high concentrations in industrial sludges. Elevation of the metal content of agricultural soils is of particular concern because of possible toxic effects on plant growth and other biological processes. Zinc is considered one of the metals most likely to produce phytotoxicity as a result of sludge application to soil (Webber, 1972). Since soils exhibit a wide range of physical and chemical properties, it is difficult to compare and extrapolate

late results of various workers with respect to the effects of Zn on soil N mineralization processes. Reported are the results of a study relating nitrification to various rates of Zn added to three agriculturally important soils. (Skogerboe-Colorado State) W78-11029

**STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS—I. DISTRIBUTION OF IMMOBILIZED NITROGEN AMONGST SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY.** Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils. J.N. Ladd, J. W. Parsons, and M. Amato. Soil Biology and Biochemistry, Vol 9, No 5, p 309-318, 1977. 5 fig, 5 tab, 27 ref.

**Descriptors:** \*Nitrogen, \*Mineralization, \*Calcareous soils, Soils, Soil investigations, Soil texture, Soil density, Glucose, Wheat, Soil amendments, Soil moisture, Soil chemistry, \*Particle size, \*Particle density.

Studies of the relative availability of nitrogenous components of soils have mostly been chemically based. Of the chemically 'defined' components, acid-hydrolyzable amino acid-N appears to contribute most to inorganic-N if judged by the amounts of N lost from this organic-N pool during periods of net mineralization. However, measurements of the percentage decrease of N from soil chemical fractions how that no component is consistently of greater biological availability. (See also W78-11033) (Skogerboe-Colorado State) W78-11032

**STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS—II. MINERALIZATION OF IMMOBILIZED NITROGEN FROM SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY.** Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils. J.N. Ladd, J. W. Parsons, and M. Amato. Soil Biology and Biochemistry, Vol 9, No 5, p 319-325, 1977. 1 fig, 5 tab, 23 ref.

**Descriptors:** \*Nitrogen, \*Mineralization, \*Calcareous soils, Soils, Soil investigations, Soil texture, Soil density, Glucose, Wheat, Soil amendments, Soil moisture, Soil chemistry, \*Particle size, \*Particle density.

15N03(-) was immobilized in a calcareous sandy soil and a calcareous clay soil each incubated with glucose and wheat straw. Net mineralization of organic-15N was more rapid in the sandy soil, irrespective of C amendment, and in soils amended with glucose. Intermittent drying and wetting of soils during incubation stimulated mineralization of 15N-labelled and native soil organic-N in all treatments. The availability (percentage mineralization) of recently-immobilized 15N consistently exceeded that of the native soil N. Ratios of the availability of labelled and unlabelled N were similar in the sandy and clay soils but varied according to C amendment, drying and wetting cycle and incubation period. (See also W78-11032) (Skogerboe-Colorado State) W78-11033

**SOIL MICROBIAL AND BIOCHEMICAL CHARACTERISTICS IN RELATION TO SOIL MANAGEMENT AND FERTILITY.** Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology. For primary bibliographic entry see Field 2G. W78-11035

**SULFUR OXIDATION AND RESPIRATION IN 54-YEAR-OLD SOIL SAMPLES.** Pacific Northwest Forest and Range Experiment Station, Corvallis, OR. Forestry Sciences Lab. W. B. Bollen. Soil Biology and Biochemistry, Vol 9, No 6, p 405-410, 1977. 3 tab, 15 ref.

**Descriptors:** \*Sulfur, \*Respiration, Sampling, \*Oxidation, \*Soil chemistry, Soil investigations, Soil properties, \*Soil tests, Soils.

Soil samples in dry storage for 54-yr retain their ability to respire and to oxidize S. Three of the soils had lower S-oxidizing capacity and three oxidized more S at 1 g kg<sup>-1</sup> than did the samples when originally collected. When the experiment was repeated with all apparatus sterilized by autoclaving and sterilized in flowing steam, a greater proportion of the S was oxidized. This was not due to heat treatment of the S. In all cases, S additions and incubation resulted in a lowering of the soil pH, suggesting that Thiobacillus thiooxidans was responsible and had survived the prolonged storage. When the soils, before and after incubation, were added to Thiobacillus media, only Gram-positive bacteria, mostly Bacillus spp., were found. (Skogerboe-Colorado State) W78-11036

**PHOSPHATASES IN SOILS.** Iowa State Univ., Ames. Dept. of Agronomy. F. Eivazi, and M. A. Tabatabai. Soil Biology and Biochemistry, Vol 9, No 3, p 167-172, 1977. 4 fig, 4 tab, 26 ref.

**Descriptors:** Soils, Soil investigations, \*Soil chemistry, \*Soil chemical properties, \*Phosphates, Alkaline soils, \*Phosphatase activity(Soils).

Most studies on phosphatase activity in soils have been concerned with acid phosphatase. This study was conducted to determine the activity of phosphomonoesterases (acid and alkaline phosphatases), phosphodiesterase, and 'phosphotriesterase'. The results indicate that acid phosphatase is predominant in acid soils and that alkaline phosphatase is predominant in alkaline soils. With universal buffer, the pH optima of phosphodiesterase and phosphotriesterase were at pH 10. The activities of these phosphatases in soils were much lower than those of the acid and alkaline phosphatases in soils indicated that air-drying increased the activity of acid phosphatase and phosphotriesterase, decreased the activity of alkaline phosphatase, but did not affect the activity of phosphodiesterase. (Skogerboe-Colorado State) W78-11037

**EFFECT OF BIURET CONTENT ON TRANSFORMATION OF UREA NITROGEN IN SOIL.** Indian Agricultural Research Inst., New Delhi Div. of Agricultural Chemicals. K. L. Sahrawat. Soil Biology and Biochemistry, Vol 9, No 3, p 173-175, 1977. 2 tab, 16 ref.

**Descriptors:** \*Urea, \*Nitrogen, Nutrients, Fertilizers, Fertilization, \*Soil chemistry, \*Nitrites, Ammonia.

The effect of the biuret content on transformations of urea-N was studied in a sandy loam (pH 7.7). While biuret did not affect urea hydrolysis, it inhibited the conversion of NH<sub>4</sub>(+) to NO<sub>2</sub>(-) and the subsequent oxidation of NO<sub>2</sub>(-) to NO<sub>3</sub>(-). This resulted in the accumulation of larger amounts of both NH<sub>4</sub>(+)-N and NO<sub>2</sub>(-)-N in soil as compared to soil receiving urea alone. The results suggest that biuret impurity in urea fertilizer is likely to enhance nitrite toxicity. (Skogerboe-Colorado State) W78-11038

**ACETYLENE INHIBITION OF NITROUS OXIDE REDUCTION AND MEASUREMENT OF DENITRIFICATION AND NITROGEN FIXATION IN SOIL.** Macdonald Coll., Ste. Anne de Bellevue (Quebec). Dept. of Microbiology. For primary bibliographic entry see Field 2G. W78-11039

**EFFECT OF NITROGEN DIOXIDE ON NITRITE OXIDATION AND NITRITE-OXIDIZING POPULATIONS IN SOIL.** Cornell Univ., Ithaca, NY. Lab. of Soil Microbiology. For primary bibliographic entry see Field 2G. W78-11043

**NITROGEN ISOTOPE DISCRIMINATION IN DENITRIFICATION OF NITRATE IN SOILS.** Iowa State Univ., Ames. Dept. of Agronomy. A. M. Blackmer, and J. M. Bremner. Soil Biology and Biochemistry, Vol. 9, No. 2, p 73-77, 1977. 2 fig, 4 tab, 21 ref.

**Descriptors:** \*Nitrogen, \*Denitrification, \*Nitrates, Soils, Soil investigations, \*Soil chemistry, \*Isotopes, Soil chemical properties.

Nitrogen isotope discrimination during denitrification in soils of nitrate containing natural concentrations of 14N and 15N was studied by determining the amount and the 15N content of nitrate-N and (nitrate + nitrite)-N in nitrate-treated soils incubated under anaerobic conditions (He atmosphere) for various times after treatment with glucose to promote denitrification. Analyses performed showed that the nitrate-N lost on incubation of these soils could largely be accounted for as products of denitrification. (Skogerboe-Colorado State) W78-11052

**AMMONIA VOLATILIZATION FROM SURFACE APPLICATIONS OF AMMONIUM COMPOUNDS TO CALCAREOUS SOILS: VI. EFFECTS OF INITIAL SOIL WATER CONTENT AND QUANTITY OF APPLIED WATER.** Texas A and M Univ., El Paso. Agricultural Research Station. For primary bibliographic entry see Field 2G. W78-11054

**SEARCH FOR NITRIFYING AGENTS IN WATER AND SOILS AS SOURCES OF NITRATES IN SURFACE WATER.** Georgia Inst. of Tech., Atlanta. Environmental Resources Center. For primary bibliographic entry see Field 5B. W78-11063

**LOW TEMPERATURE ADAPTED SUBMERSIBLE SPECTROPHOTOMETERS FOR USE IN FLOATING ICE RESEARCH.** Department of the Environment, Ottawa (Ontario). Inland Waters Directorate. W. A. Adams, and P. A. Flavelle. Scientific Series No. 82, 1978, 15 p, 18 fig, 9 ref, 3 tab.

**Descriptors:** \*Spectrophotometry, \*Spectrometers, \*Adaptation, \*Floating, \*Ice, Penetration, \*Solar radiation, Limnology, Glaciology, Calibrations, \*Low temperature, \*Submersible spectrophotometers, Spectroscopic techniques.

The calibration and operation of underwater spectrometers in the visible region (400 nm to 750 nm) are described. The application of the spectrometers for the measurement of the penetration of solar radiation through floating ice presented with examples of systems used for a variety of ice conditions. The methods used for handling the data,

## Field 2—WATER CYCLE

### Group 2K—Chemical Processes

both analog and digital, are given. Also discussed is the role of these spectroscopic techniques in glaciological and limnological studies. (WATDOC) W78-11190

**INTERLABORATORY QUALITY CONTROL STUDY NO. 14 MAJOR IONS: CALCIUM, MAGNESIUM, SODIUM POTASSIUM, HARDNESS, ALKALINITY, CHLORIDE, SULPHATE AND NITRATE.**  
Canada Centre for Inland Waters, Burlington (Ontario).  
For primary bibliographic entry see Field 5A.  
W78-11191

**TURBULENT DIFFUSION PROCESSES IN THE GREAT LAKES.**  
Canada Centre for Inland Waters, Burlington (Ontario).  
For primary bibliographic entry see Field 2H.  
W78-11193

**INTERLABORATORY QUALITY CONTROL STUDY NO. 15 TOTAL PHOSPHORUS IN NATURAL WATERS.**  
Canada Centre for Inland Waters, Burlington (Ontario).  
For primary bibliographic entry see Field 5A.  
W78-11194

**ATMOSPHERIC BULK PRECIPITATION IN THE LAKE ERIE BASIN.**  
Canada Centre for Inland Waters, Burlington (Ontario).  
For primary bibliographic entry see Field 5A.  
W78-11195

**CHARGE CHARACTERISTICS OF SPODIC HORIZONS.**  
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agronomy.  
For primary bibliographic entry see Field 2G.  
W78-11200

**INORGANIC PHOSPHORUS SPECIES AND TRANSFER MECHANISMS IN SOILS TO SEDIMENTS FOR TWO SMALL KANSAS WATERSHEDS.**  
Kansas Water Resources Research Inst., Manhattan.  
For primary bibliographic entry see Field 5B.  
W78-11206

**GEOCHEMISTRY OF THE MATTOLE RIVER OF NORTHERN CALIFORNIA.**  
Geological Survey, Menlo Park, CA. Water Resources Div.  
V. C. Kennedy, and R. L. Malcolm.  
Open-file report 78-205, December 1977. 324 p, 56 fig, 108 tab, 171 ref.

Descriptors: \*Geochemistry, \*Rainfall, \*Runoff, \*Ion exchange, \*Water chemistry, Sediment discharge, Soils, Trace elements, Nutrients, Subsurface runoff, Estuaries, Storms, Streamflow, \*California, \*Mattole River, Mendocino County (Calif).

The chemical composition of streams can vary greatly with changing discharge during storm runoff. These chemical changes are related to the pathways of various water parcels from the time they fall as rain until they enter the stream, and to the interactions between water and sediment during transport downstream. In order to understand better the chemical variations during storms, an extensive investigation was made of the Mattole River, a chemically clean coastal stream in Mendocino County, California. The Mattole drains a topographically mature basin of 620 sq km which has relief of about 1200 m, a long summer dry

season, and mean annual rainfall of about 2300 mm. The stream flow is composed of seasonally varying proportions of four flow components, namely, surface runoff, quick-return flow (rainfall having brief and intimate contact with the soil before entering the surface drainage), delayed-return flow, and base runoff. Each component is identified by its characteristic chemistry and by the time delay between rainfall and entrance into the stream. Information is also presented on rain chemistry, adsorption reactions of suspended sediments in the fresh and brackish environments, and compositional variation of river sediments with particle size. (Woodard-USGS) W78-11255

**DETERMINATION OF DISSOLVED BORON IN FRESH, ESTUARINE, AND GEOTHERMAL WATERS BY D.C. ARGON-PLASMA EMISSION SPECTROMETRY.**  
Geological Survey, Menlo Park, CA. Water Resources Div. and Geological Survey, Menlo Park, CA. Geologic Div.  
For primary bibliographic entry see Field 5A.  
W78-11256

**MONITORING WATER-QUALITY DURING PILOT DREDGING IN THE WILLAMETTE AND COLUMBIA RIVERS, OREGON.**  
Geological Survey, Portland, OR. Water Resources Div.  
For primary bibliographic entry see Field 5A.  
W78-11261

**STRATIGRAPHIC TEST WELL, NANTUCKET ISLAND, MASSACHUSETTS.**  
Geological Survey, Reston, VA. Geologic Div.  
For primary bibliographic entry see Field 4B.  
W78-11266

## 2L. Estuaries

**MODELLING OF WATER EXCHANGE IN AN ESTUARY.**  
National Board of Waters, Helsinki (Finland). Hydrological Office.  
J. Sarkkula, and M. Virtanen.  
Nordic Hydrology, Vol 9, No 1, p 43-56, 1978. 5 fig, 9 ref.

Descriptors: \*Estuaries, \*Water circulation, \*Bridges, \*Model studies, mathematical models, Regression analysis, Flow, Discharge(Water), Mixing, Tidal waters, Coasts, Rivers, Winds, Circulation, Numerical analysis, \*Finland.

A two-dimensional horizontal hydrodynamical model was used to estimate the changes that a harbor road will cause in the water exchange of an estuary. The research area was the Kokemaenjoki river estuary on the coast of the Gulf of Bothnia in western Finland. The numerical model was verified on the basis of a regression model describing the water exchange of the estuary at present with a multiple correlation squared of 0.9. The factors having an influence on the water exchange were the wind, the sea level fluctuation, and the river discharge. The changes in the water exchange were considered during a dry spell, a flood period, and an average year with three different cross section areas of the road line. The accuracy and reliability of the estimation were found to be very satisfactory. (Sims-ISWS) W78-10529

**ASSESSMENT OF PROBABILITY OF THE PROBABLE MAXIMUM HURRICANE EVENT AND ITS ASSOCIATED FLOODING POTENTIAL.**  
Boston Edison Co., MA. Environmental Science. F. J. Mogolesko.  
Journal of Applied Meteorology, Vol 17, No 7, p 921-925, July 1978. 3 fig, 4 tab, 10 ref.

Descriptors: \*Hurricanes, \*Maximum probable flood, \*Model studies, \*Mathematical models, Probability, Floods, Nuclear powerplants, Coasts, Hazards, Data processing, Analytical techniques, Storms, Statistics, Climatology.

The development of a model for hurricane-induced coastal flooding and the assignment of a probability distribution for each contributing event make it possible to estimate the probability of occurrence versus flood elevation. Additionally, this procedure could be used to establish the probability associated with the Probable Maximum Hurricane (PMH). A probabilistic analysis of PMH parameters and tidal elevation was made to estimate the frequency of a combined PMH induced surge and high tide event. Another probability analysis was made for the record high water elevation at a nearby tide-gage station. As a result of the above analysis, it was suggested that PMH water levels are excessively conservative. (Sims-ISWS) W78-10532

**THE IMPACT OF FRENCH NUCLEAR INSTALLATIONS ON THE AQUATIC ENVIRONMENT, IMPACT DES INSTALLATIONS NUCLEAIRES FRANCAISES SUR L'ENVIRONNEMENT AQUATIQUE.**  
CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de radioecologie.  
For primary bibliographic entry see Field 5C.  
W78-10555

**MARINE POLLUTION IN SURUGA BAY AND ASSOCIATED ENVIRONMENTAL CHANGE IN RELATION TO FISHERIES (IN JAPANESE).**  
For primary bibliographic entry see Field 5C.  
W78-10573

**ALGAL METABOLITES AND FISH KILLS IN A BAYOU ESTUARY: AN ALTERNATIVE EXPLANATION TO THE LOW DISSOLVED OXYGEN CONTROVERSY.**  
University of West Florida, Pensacola. Faculty of Biology.  
For primary bibliographic entry see Field 5C.  
W78-10582

**SURFACE WATER RECORDS OF COOK INLET BASIN, ALASKA, THROUGH SEPTEMBER 1975.**  
Geological Survey, Anchorage, AL. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10621

**A PROGRESS REPORT ON ESTUARY MODELING BY THE FINITE-ELEMENT METHOD.**  
Geological Survey, Reston, VA. Water Resources Div.  
W. G. Gray.  
Open-file report 78-479, May 1978. 79 p, 15 fig, 12 ref.

Descriptors: \*Model studies, \*Estuaries, \*Finite element analysis, \*Computer models, \*Tidal effects, Mathematical models, Analytical techniques, Flow characteristics, Equations.

Various schemes are investigated for finite-element modeling of two-dimensional surface-water flows. The first schemes investigated combine finite-element spatial discretization with split-step time stepping schemes that have been found useful in finite-difference computations. Because of the large number of numerical integrations performed in space and the large sparse matrices solved, these finite-element schemes were found to be economically uncompetitive with finite-difference schemes. A very promising leapfrog scheme is proposed which, when combined with a novel very



fast spatial integration procedure, eliminates the need to solve any matrices at all. Additional problems attacked included proper propagation of waves and proper specification of the normal flow-boundary condition. This report indicates work in progress and does not come to a definitive conclusion as to the best approach for finite-element modeling of surface-water problems. The results presented represent findings obtained between September 1973 and July 1976. (Woodard-USGS)  
W78-10648

**SHORE EROSION CONTROL STRUCTURE,**  
Sandgrabber, Inc., Bay City, MI. (Assignee).  
For primary bibliographic entry see Field 8A.  
W78-10704

**UNDERWATER TRUSSES FOR BREAKWATER STRUCTURE,**  
For primary bibliographic entry see Field 8A.  
W78-10713

**CADMIUM IN PORT PHILLIP BAY MUSSELS,**  
La Trobe Univ., Bundoora (Australia) Dept. of Inorganic and Analytical Chemistry.  
For primary bibliographic entry see Field 5B.  
W78-10743

**MOASSAY DATA FOR MARINE POLLUTION USING SEA URCHIN EGGS, 1974,**  
Seto Marine Biological Lab. (Japan).  
For primary bibliographic entry see Field 5A.  
W78-10744

**BENTHIC MOLLUSCAN ASSEMBLAGES IN RELATION TO SEDIMENT GRADIENTS IN NORTHEASTERN LONG ISLAND SOUND, CONNECTICUT,**  
City Univ. of New York. Inst. of Oceanography.  
For primary bibliographic entry see Field 5B.  
W78-10747

**CONSERVATION PROBLEMS IN THE NORFOLK BROADS AND RIVERS OF EAST ANGLIA, ENGLAND-PHYTOPLANKTON, BOATS AND THE CAUSES OF TURBIDITY,**  
University of East Anglia, Norwich (England). School of Environmental Sciences.  
For primary bibliographic entry see Field 5C.  
W78-10752

**COASTAL CONFLICTS AND THE COURTS,**  
For primary bibliographic entry see Field 6E.  
W78-10779

**FLORIDA REGIONAL COASTAL ZONE STUDIES: EXISTING LEGAL AUTHORITIES.**  
Florida Dept. of Natural Resources, Tallahassee. Bureau of Coastal Zone Planning.  
For primary bibliographic entry see Field 6E.  
W78-10780

**LAND SUBSIDENCE: MENACE TO THE TEXAS GULF COAST,**  
Harris-Galveston Coastal Subsidence District, Houston, TX.  
For primary bibliographic entry see Field 6E.  
W78-10782

**THE VIRGINIA COAST RESERVE: ACQUISITION STRATEGIES FOR COASTAL ZONE PRESERVATION,**  
Nature Conservancy, Arlington, VA.  
For primary bibliographic entry see Field 6F.  
W78-10787

**CURRENT STATUS OF THE WASHINGTON COASTAL ZONE MANAGEMENT PROGRAM AMENDMENT,**  
Washington State Dept. of Ecology, Olympia. Shoreline Div.  
For primary bibliographic entry see Field 6E.  
W78-10831

**EMERGING PATTERNS OF DECISIONS (THE APPLICATION OF POLICY IN THE ADMINISTRATION OF THE SHORELINE MANAGEMENT ACT IN WASHINGTON),**  
Shorelines Hearings Board, Lacey, WA.  
For primary bibliographic entry see Field 6E.  
W78-10832

**SURFACE WATER: TEXAS GULF COAST ALTERNATIVE TO SUBSIDENCE,**  
Harris-Galveston Coastal Subsidence District, Houston, TX.  
For primary bibliographic entry see Field 6E.  
W78-10840

**COASTAL ZONE IMPACTS OF OFFSHORE OIL AND GAS DEVELOPMENT: AN ACCOMMODATION THROUGH THE CALIFORNIA COASTAL ACT OF 1976,**  
For primary bibliographic entry see Field 6E.  
W78-10859

**WAVE SETUP ON A SLOPING BEACH,**  
Coastal Engineering Research Center, Fort Belvoir, VA.  
J. R. Lesnick.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A047 358. Price codes: A02 in paper copy, A01 in microfiche. Report CERC-CETA-77-5, September 1977. 16 p, 4 fig, 5 ref.

Descriptors: \*Waves(Water), \*Ocean waves, \*Beaches, \*Model studies, Mathematical models, Berms, Coasts, Coastal engineering, Coastal structures, Wave setup.

Design of coastal structures requires consideration of abnormally high water levels produced by storms. An important component of the storm surge can be the rise in water level produced by wave action. The wave train approaching the coast and breaking offshore causes the water to pile up on the beach. Depending upon the wave characteristics (height and period) and beach slope, this accumulation of water will continue until the slope of the water surface in the onshore-offshore direction results in a head which balances the forces tending to drive the water onto the beach. This rise in water level is commonly called wave setup. This report combined the material previously presented in Sections 2.62 and 3.85 of the Shore Protection Manual. Computation of wave setup on beaches as steep as 1 on 10 ( $m=0.01$ ) can be easily determined by graphical means when incident wave conditions are defined. Practical applications were discussed and two example problems were provided. (Sims-ISWS)  
W78-10929

**A THREE-DIMENSIONAL NUMERICAL MODEL FOR PREDICTING POLLUTANT AND SEDIMENT TRANSPORT USING AN EULERIAN-LAGRANGIAN MARKER PARTICLE TECHNIQUE,**  
Rhode Island Univ., Kingston. Dept. of Ocean Engineering.  
For primary bibliographic entry see Field 5B.  
W78-10933

**WAVE OVERTOPPING EQUATION,**  
Coastal Engineering Research Center, Fort Belvoir, VA.  
J. R. Weggel.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A042 678. Price codes: A02 in paper copy, A01 in microfiche. CERC Reprint 77-7, August 1977. 47 p, 8 fig, 1 tab, 5 ref, 1 append. Reprinted from: Proceedings of the 15th Coastal Engineering Conference, Honolulu, Hawaii, July 11-17, 1976, p 2737-2755.

Descriptors: \*Waves(Water), \*Ocean waves, \*Shores, \*Structures, Beaches, Coasts, Lakes, Model studies, Mathematical models, Equations, Levees, Slopes, \*Wave overtopping.

Some available data on wave overtopping by monochromatic waves were reevaluated before publication of the Shore Protection Manual. The analysis of earlier data was made in order to summarize and present it in a more readily usable form. This paper provided empirical equations which can be used to predict overtopping rates for various structure slopes and structure types if accurate predictions of runup are available. (Sims-ISWS)  
W78-10936

**MODELING OF ECOLOGICAL SUCCESSION AND PRODUCTION IN ESTUARINE MARSHES,**  
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.  
J. C. Zieman, and W. E. Odum.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 929. Price codes: A13 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-35, November 1977. 265 p, 63 fig, 8 tab, 79 ref, 3 append.

Descriptors: \*Estuarine environment, \*Model studies, \*Salt marshes, Plant growth, Salinity, \*Ecological succession, \*Dredged material, *Spartina alterniflora*, *Spartina patens*, *Distichlis spicata*.

Three parallel studies were conducted with the development of a simulation model of plant growth and succession on a salt marsh being the ultimate objective. Field studies showed that *Spartina alterniflora* exhibited a strong positive correlation with the elevation and tidal inundations at the two major study sites, Taskinas Creek and Bennett's Creek, in Virginia. *S. alterniflora* showed a negative correlation with soil salinity and significant positive correlation with available iron. Responses of *S. patens* and *Distichlis spicata* were more variable, but where regular flooding occurred there was a strong positive correlation with *S. patens* abundance and negative correlation with *D. spicata*. Records from the continuous monitoring study reinforce the concept of tidal inundation acting as a master variable. A model was developed which depicted plant growth and succession across a transect. The model was driven by solar radiation, temperature, soil salinity, and tidal inundation. The model showed plant growth controlled primarily by tidal inundation, with influences felt from radiation and temperature, but little influence due to salinity. (WES)  
W78-10945

**STABILITY TESTS OF NAWILIWILI BREAK-WATER REPAIR,**  
Army Engineer Waterways Experiment Station, Vicksburg, MS.  
For primary bibliographic entry see Field 8B.  
W78-10948

**HABITAT DEVELOPMENT FIELD INVESTIGATIONS, WINDMILL POINT MARSH DEVELOPMENT SITE, JAMES RIVER, VIRGINIA; APPENDIX C: ENVIRONMENTAL IMPACTS OF MARSH DEVELOPMENT WITH DREDGED**

## Field 2—WATER CYCLE

### Group 2L—Estuaries

**MATERIAL: ACUTE IMPACTS ON THE MACROBENTHIC COMMUNITY,** Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography. For primary bibliographic entry see Field 5C. W78-10954

**SEAGRASS LITERATURE SURVEY,** Virginia Univ., Charlottesville. Dept. of Environmental Sciences. For primary bibliographic entry see Field 2L. W78-10958

**SEAGRASS LITERATURE SURVEY,** Virginia Univ., Charlottesville. Dept. of Environmental Sciences. J. C. Zieman, K. W. Bridges, and C. P. McRoy. Available from the National Technical Information Service, Springfield, VA 22161 as AD-A054 480. Price codes: A10 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-78-4, Jan. 1978. 213 p, 2 append.

**Descriptors:** Surveys, \*Bibliographies, \*Literature reviews, Plant populations, \*Seagrasses, Water quality, Productivity, Plant physiology.

An extensive review of the literature pertaining to seagrasses was accomplished through a search of published literature and unpublished documents up to mid 1977. Broad scientific subject areas that relate to seagrasses such as anatomy, ecology, morphology, taxonomy, and physiology were considered together with more specific factors such as substrate selectivity, water quality, productivity, colonization, effect of physical energy (waves, tidal currents, sediment transport), propagation, and tolerance to disturbance. The bibliography is divided into two main reference sections consisting of a bibliographic citations section and a keyword index section. Also, two supplementary reference sections consisting of an author index section and a source index section appear as appendices in microfiche form. (WES) W78-10958

**AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX B: ROLE OF DISPOSAL OF PCB-CONTAMINATED SEDIMENT IN THE ACCUMULATION OF PCB'S BY MARINE ANIMALS,** National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center. For primary bibliographic entry see Field 5C. W78-10959

**AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; APPENDIX E: DEMERSAL FISH AND DECAPOD SHELLFISH STUDIES,** National Marine Fisheries Service, Hammond, OR. For primary bibliographic entry see Field 5C. W78-10960

**AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON; APPENDIX E: RELEASE AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS INDUCED BY OPEN-WATER DREDGE DISPOSAL ACTIVITIES,** Washington Univ., Seattle. Dept. of Oceanography. For primary bibliographic entry see Field 5B. W78-10962

**OIL POLLUTION ON ISRAELI COASTS,** Oil Pollution South East Kent, Dover (England). For primary bibliographic entry see Field 5B.

W78-10968

**POLLUTION EFFECTS ON INTERTIDAL MACROBENTHIC COMMUNITIES,** Napier Coll. of Commerce and Technology Edinburgh (Scotland). For primary bibliographic entry see Field 5C. W78-11007

**BENTHOS AROUND AN OUTFALL OF THE WERRIBEE SEWAGE-TREATMENT FARM, PORT PHILLIP BAY, VICTORIA,** Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group. For primary bibliographic entry see Field 5C. W78-11024

**INSTITUTIONAL ARRANGEMENTS FOR EFFECTIVE GROUNDWATER MANAGEMENT TO HALT LAND SUBSIDENCE,** Texas A and M Univ., College Station. Dept. of Animal Science. For primary bibliographic entry see Field 4B. W78-11057

**AQUACULTURE OF THE GREEN MUSSEL, MYTILUS VIRIDIS LINNAEUS, IN MALAYSIA,** Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihayat. P. M. Sivalingam. Aquaculture, Vol 11, No 4, August 1977, p 297-312, 13 fig, 4 tab, 51 ref.

**Descriptors:** Environmental effects, \*Temperature, \*Salinity, Hydrogen ion concentration, \*Mussels, Spawning, \*Aquaculture.

Induced spawning studies with *M. viridis* indicated that neither plain temperature jumps, pH nor salinity variations were effective but four temperature cycles of 20 min. duration between 25 and 35°C in a seawater medium containing 0.2% NH<sub>4</sub>OH induced spawning. Salinity, between 24 and 80‰, 50% temperature tolerant between 10 and 35°C and 50% pH tolerant between pH 3.5 and 9. Under natural conditions, spawning occurs twice a year, in March and April, and October and November. (Chilton-ORN) W78-11099

**INTERIM ASSESSMENT OF WASHINGTON STATE SHORELINES MANAGEMENT,** Washington Univ., Seattle. Dept. of Geography. For primary bibliographic entry see Field 6E. W78-11164

**A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME IV, TURBULENT ENERGY COMPUTATION,** Rand Corp., Santa Monica, CA. J. J. Leendertse, and S. K. Liu. Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 964. Price codes: A04 in paper copy, A01 in microfiche. Completion Report No. R-2187-OWRT, May 1977. 59 p, 40 fig, 1 tab, 16 ref, 2 append. OWRT C-7072(6231)(2).

**Descriptors:** \*Three-dimensional flow, \*Estuaries, \*Mathematical models, \*Numerical methods, Tides, Fluid dynamics, Computer models, Coastal engineering, Development of models, Finite differences, Simulation, Unsteady flow, Computation, Turbulent energy.

Three-dimensional flows in water bodies with non-homogeneous density can be computed by use of a finite difference model which contains an equation of continuity, equations describing conservation of momentum, salinity, temperature, subgridscale energy, and an equation of state. In the model, vertical accelerations are neglected, but not the

vertical velocities. The vertical exchange coefficients are computed from the subgridscale energy intensity. Experiments made with the model produced velocity distributions which typically occur in coastal areas. (See also W78-11210; W78-07016; W75-10900 and W74-04301) W78-11209

**A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME V, TURBULENT ENERGY PROGRAM,** Rand Corp., Santa Monica, CA. S. K. Liu, and A. B. Nelson. Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 965. Price codes: A05 in paper copy, A01 in microfiche. Completion Report No. R-2188-OWRT, May 1977. 90 p, 4 ref, 4 append. OWRT C-7072(No. 6231)(3).

**Descriptors:** \*Three-dimensional flow, \*Estuaries, \*Mathematical models, \*Numerical methods, Tides, Fluid dynamics, \*Computer models, Coastal engineering, Development of models, Finite differences, Simulation, Unsteady flow, \*Computer programs, Turbulent energy(Flow), Computation.

A computer program of a three-dimensional model, including subgridscale turbulent energy for nonhomogeneous estuaries and coastal seas is presented. The computer code is programmed for the implementation of computation methods described by Leendertse and Liu (A Three-Dimensional Model for Estuaries and Coastal Seas: Volume IV, (See W78-11209)). The program can perform numerical integration of the equations of motion, continuity, transport of salt, heat, turbulent energy and a pollutant constituent. The dynamic fields of salinity and temperature are coupled to the equations of motion through the use of a nonlinear equation of state. The effect of the vertical density gradient on the vertical exchange is evaluated by the Richardson number computed using the local turbulent energy level. In addition to the main computer program, the variable definitions, input parameters, implementation and operational aspects are described, followed by a sample case. (See also W76-07016; W75-10900 and W74-04301) W78-11210

**MODELING SEDIMENT MOVEMENT IN THE TURBIDITY MAXIMUM OF AN ESTUARY,** Virginia Inst. of Marine Science Gloucester Point. A. Kuo, M. Nichols, and J. Lewis. Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 989. Price codes: A05 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 111, June 1978. 76 p, 23 fig, 32 ref, 1 append. OWRT B-077-VA(1).

**Descriptors:** \*Estuaries, \*Sediment transport, Model studies, Turbidity, Simulation analysis, Tides, Salinity, Distribution patterns, \*Mathematical models, Turbidity maximum.

This research developed a two-dimensional, time-dependent numerical model to simulate the movement of water and suspended sediment in the turbidity maximum of an estuary. This model is a systematic sequence of mathematical procedures derived from the mass-balance equation and the equation of motion. Lateral integration is used to obtain two-dimensional equations; these equations are integrated with depth over the height of successive layers. Finite difference equations then are written for each layer and solved numerically using prescribed boundary conditions. The model yields values for time-varying tidal height, current speed, salinity, and suspended sediment concentration (turbidity) throughout the estuary. In turn, these variations reveal the response to tidal current fluctuations of both salinity and sediment distributions within the maximum. Residual values of each parameter are obtained by averaging respect-



ive values over a tidal cycle. By examining the time-varying and tidal-average transport at landward and seaward transects, sediment transport through the turbidity maximum may be studied in detail. Using this numerical model permits analyses of hydraulic processes that lead to suspended sediment accumulation.  
W78-11213

#### FACTORS INFLUENCING EQUILIBRIUM OF A MODEL SAND BEACH

Texas A and M Univ., College Station. Dept. of Oceanography; and Texas A and M Univ., College Station. Ocean Engineering Program.  
D. C. Smith, IV, J. B. Herbich, and T. W. Spence. Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 401, Price codes: A05 in paper copy, A01 in microfiche. Sea Grant Program Report No. TAMU-SG-77-203, November 1976. 97 p, 39 fig, 7 tab, 24 ref, 3 append. Also as: COE Report No. 189. SG-04-6-158-44012.

Descriptors: \*Beaches, \*Shore protection, \*Erosion, Baseline studies, Resources development, Environmental effects, Outer Continental Shelf, Beach profiles.

Characteristics of a two-dimensional model beach subjected to wave action and with initial slope 1:60 were investigated. The hypothesis that the beach profile reaches a repeatable equilibrium form was tested. It was found that the entire profile did not have a repeatable equilibrium shape, possibly due to minor uncontrollable water level variations. Certain features of the profile were found to exhibit better qualities than others. The maximum height of the beach crest above stillwater was determined to have a repeatable and stable shape. For other test data with initial slopes 1:20 and 1:30, the maximum height of the beach crest was found to correlate well with the deepwater wavelength. The initial slope was determined to have a significant effect on the determined relations. (Sinha-OEIS)  
W78-11221

#### DREDGING IN ESTUARIES - A GUIDE FOR REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS. SYMPOSIUM/WORKSHOP PROCEEDINGS, MARCH 1977, RESTON, VIRGINIA

Research Triangle Inst., Research Triangle Park, NC.; and Oregon State Univ., Corvallis.  
M. F. Massoglia. Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 799, Price codes: A11 in paper copy, A01 in microfiche. National Science Foundation, Research Applied to National Needs Report No. NSF/RA-770284, March 1977. 276 p, 3 append. AEN 71-01908A03.

Descriptors: \*Estuaries, \*Dredging, \*Environmental effects, \*Water pollution effects, Resources development, Environmental impact statements, Workshops.

The purpose of this symposium/workshop was to familiarize various user groups with the 'Guidelines for Impact Assessment of Dredging in Estuaries' prepared by Oregon State University (OSU). The guidelines provide a methodology that is intended to ensure that the quality of the data contained in an Environmental Impact Statement (EIS) is adequate to comply with the intent of the National Environmental Policy Act of 1969 (NEPA). The guidelines, used in conjunction with this symposium/workshop proceedings report, are intended to assist the Corps of Engineers, the Environmental Protection Agency, the Maritime Administration, estuary managers, and individuals in the extremely important process of evaluating and preparing environmental impact statements for dredging in estuaries. The symposium/workshop consists of a series of presentations by the OSU research team; four concurrent workshop ses-

sions; presentations by individuals from public and private organizations involved in planning, decision making, regulation, and evaluation of estuarine dredging; and a public session. (Sinha-OEIS)  
W78-11222

#### DETAILED BATHYMETRY OF SELECTED AREAS OF THE INNER CONTINENTAL SHELF OF THE VIRGINIAN SEA: SOUTHEASTERN VIRGINIA, VIRGINIA BEACH AND VACHAPREAGUE, VIRGINIA

Virginia Inst., of Marine Science, Gloucester Point.  
C. H. Sutton, V. Goldsmith, and A. H. Sallenger. Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 204, Price codes: A03 in paper copy, A01 in microfiche. Virginia Institute of Marine Science Special Report in Applied Marine Science and Ocean Engineering, No. SRMSOE-69, 1976. 15 p, 4 fig, 3 tab, 5 plate, 5 infold maps.

Descriptors: \*Continental Shelf, \*Virginia, \*Bathymetry, Resources development, Baseline studies, Water quality control, Outer Continental Shelf.

The increased need for information involving the physical processes affecting the inner continental shelf has led to the preparation of detailed compilations of the nearshore bathymetric data of the Virginian coastline. Contrived short-term and the apparent long-term shortages of fuel have initiated an intensive study of the adjacent continental shelf area for possible future sites of offshore drilling rigs, power plants and port facilities. Among the basic oceanographic information required in all such studies is detailed depth information. To help meet these needs detailed bathymetric maps containing significantly more information than has previously been compiled have been prepared and made available from this region of the Atlantic shelf. (Sinha-OEIS)  
W78-11225

#### HYDROGRAPHY OF OREGON ESTUARIES PRIOR TO JUNE 1956

Oregon State Coll., Corvallis. School of Science.  
W. V. Burt. Available from the National Technical Information Service, Springfield, VA 22161 as AD-A106 790-9, Price codes: A02 in paper copy, A01 in microfiche. Data Report No. 2, Reference 56-2, June 1956, 24 p. ONR-1286(02).

Descriptors: \*Oregon, \*Estuaries, \*Hydrography, Baseline studies, Resources development, Environmental effects, Water quality, Outer Continental Shelf.

The data presented in this report consists of hydrographic information for ten Oregon estuaries. Most of the sampling stations are listed by some land mark. Most of the readily available unpublished hydrographic data for Oregon Estuaries which was collected prior to June 1956 have been tabulated. Data on water temperature, salinity and velocity are presented. Data collected by the Navy Hydrographic Office and the USC and GS are not included. (Sinha-OEIS)  
W78-11226

#### BRUNSWICK ESTUARY STUDY

Georgia Dept. of Natural Resources Atlanta. Environmental Protection Div.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 784, Price codes: A04 in paper copy, A01 in microfiche. August 1976. 56 p, 4 fig.

Descriptors: \*Georgia, \*Estuaries, \*Water quality, \*Water pollution sources, Hydrography, Baseline studies, Resources development, Outer Continental Shelf.

Intensive surveys of the Brunswick and Medway Estuaries were conducted from August 4 through August 5, 1976 by the Environmental Protection Division of the Georgia Department of Natural Resources. The purpose of the surveys was to determine present dissolved oxygen levels in Brunswick Estuary during a warm weather period, estimate dissolved oxygen levels if there were no pollution entering the Estuary, and predict the effect additional organic loadings would have on the Estuary. The Brunswick Estuary has two major sources of organic wastewaters. There are Brunswick Pulp and Paper Company and the City of Brunswick Wastewater Treatment Facility. Other sources of pollution include a large discharge from Hercules Incorporated and several seafood related industries located along Brunswick Harbor. Graphs of diel data and other field data are included in this report as well as conclusions drawn from this study and recommendations for future studies. (Sinha-OEIS)  
W78-11227

#### PHYSICAL, CHEMICAL AND BIOLOGICAL EFFECTS OF DREDGING IN THE THAMES RIVER (CT) AND SPOIL DISPOSAL AT THE NEW LONDON (CT) DUMPING GROUND. National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center.

For primary bibliographic entry see Field 5C.  
W78-11229

#### EXCHANGE OF MANGANESE, IRON, COPPER, AND ZINC BETWEEN DISSOLVED AND PARTICULATE FORMS IN THE NEWPORT RIVER ESTUARY, NORTH CAROLINA, Oregon State Univ., Corvallis. School of Oceanography.

For primary bibliographic entry see Field 5B.  
W78-11230

#### A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOLUME IX, THE COMPUTER PROGRAM

Rand Corp., Santa Monica, CA.  
For primary bibliographic entry see Field 5B.  
W78-11231

#### INTERIM HIERARCHICAL REGIONAL CLASSIFICATION SCHEME FOR COASTAL ECOSYSTEMS OF THE UNITED STATES AND ITS TERRITORIES

Fish and Wildlife Service Fort Collins, CO.  
T. T. Terrell. Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 691, Price codes: A03 in paper copy, A01 in microfiche. Fish and Wildlife Service, Office of Biological Services Report No. FWS/OBS-77/48, September 1977. 46 p, 4 fig, 2 tab, 55 ref.

Descriptors: \*Coasts, \*Ecosystems, \*United States, \*Baseline studies, Bibliographies, Resources development, Water quality, Environmental effects, Outer Continental Shelf.

The literature on coastal classifications is reviewed. Those existing classifications classify coastal areas on functional, structural, or regional (geographical) attributes. The problem of predicting impacts on coastal ecosystems by various types of perturbations, such as offshore mineral development or reduced freshwater inflow into estuaries, at various levels of resolution is posed. A classification system which will permit aid in data collection to address this problem is necessary for solving this problem. Existing systems are found wanting, and a hierarchical regional classification scheme for coastal ecosystems of the United States and its territories, based on the physical, hydrological, chemical, biological, geological, and structural characteristics of those areas is presented. (Sinha-OEIS)  
W78-11233

## Field 2—WATER CYCLE

### Group 2L—Estuaries

**A CASE HISTORY OF PORT MANSFIELD CHANNEL, TEXAS,**  
Coastal Engineering Research Center, Fort Belvoir, VA.  
For primary bibliographic entry see Field 8B.  
W78-11235

**LABORATORY INVESTIGATION OF TIDAL INLETS ON SANDY COASTS,**  
California Univ. Berkeley. Hydraulic Engineering Lab.  
For primary bibliographic entry see Field 8B.  
W78-11236

**DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME I: PROCESSING SYSTEMS SUMMARY.**  
Dames and Moore, Salt Lake City, UT.; and EIC Corp., Newton, MA.  
For primary bibliographic entry see Field 5C.  
W78-11239

**FEEDING BY AN OMNIVOROUS PLANKTONIC COPEPOD AETIDEUS DIVERGENS BRADFORD,**  
Washington Univ., Seattle. Dept. of Oceanography.  
For primary bibliographic entry see Field 5C.  
W78-11283

**TRACE METAL CONCENTRATIONS AND PARTITIONING IN ZOOPLANKTON, NEUSTON, BENTHOS FROM THE SOUTH TEXAS OUTER CONTINENTAL SHELF,**  
Texas A and M Univ., College Station. Dept. of Oceanography.  
For primary bibliographic entry see Field 5C.  
W78-11285

**NUTRIENT DISTRIBUTION IN THE ST. LAWRENCE ESTUARY,**  
McGill Univ., Montreal (Quebec) Marine Sciences Centre.  
For primary bibliographic entry see Field 5C.  
W78-11290

**FEEDING RATES OF PLANKTONIC COPEPODS FROM A TROPICAL SEA,**  
Australian Inst. of Marine Science, Townsville.  
For primary bibliographic entry see Field 5C.  
W78-11294

**SEASONAL VARIATIONS IN SALT-MARSH MACROALGAE PHOTOSYNTHESIS. II. FUCUS VESICULOSUS AND ULVA LACTUCA,**  
State Univ. of New York at Stony Brook. Marine Sciences Research Center.  
For primary bibliographic entry see Field 5C.  
W78-11297

**THE RELATIONSHIP OF 'SPARTINA ALTERNIFLORA' TO MEAN HIGH WATER,**  
State Univ. of New York at Stony Brook. Marine Sciences Research Center.  
L. Lagna.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 932.  
Price codes: A06 in paper copy A01 in microfiche.  
Report No. SS-409 to National Oceanic and Atmospheric Administration, Washington, D.C., May 1974. 105 p, 13 fig, 7 tab, 54 ref, 2 append. Sea Grant No. 2-35281.

Descriptors: \*Spartina alterniflora, \*High water mark, \*Long Island(NY), \*Tidal effects, \*Tidal marshes, \*Marsh plants, \*Jurisdiction, \*Legal aspects, \*Public lands, Wetlands, Mean high water, Salt marshes, Salinity, Topography, Navigable waters, Ponds, Flax Pond(NY), Mat-

tutuck Inlet(NY), Orient Point(NY), Iron Point(NY), Gunning Point(NY), Shores.

A study of *Spartina alterniflora* zonation in five tidal salt marshes on Long Island, New York, showed that vegetation cannot be used to indicate the line of mean high water (MHW) on the marsh surface. Neither species distribution nor plant vigor were closely correlated with tidal elevation. The use of the *S. alterniflora*-*S. patens* ecotone to indicate the boundary between public and private ownership or the upper limit of jurisdiction in navigable waters is therefore not recommended. The five marshes studies were Flax Pond, Matitutuck Inlet, Orient Point, Iron Point, and Gunning Point. In some areas *S. alterniflora* was found growing well above MHW, and it should not be assumed that most of the *S. alterniflora* marsh is under protection of public ownership or navigable waters. The upland border of the five marshes likewise failed to coincide with any particular tidal datum. A tidal plane used in a wetlands definitions should be only one of several criteria, such as reduced number of certain plant species, occurrence of salt marsh peat at the surface level, or height above mean low water equal to a predetermined factor times the local tide range. Factors which appear to modify the tide-elevation effect include salinity and substrate. Tide elevation may influence vegetation more in terms of topography than an absolute species-elevation relationship; for example, an area surrounded by higher surfaces may support a growth of vegetation usually found at lower elevations. (Lynch-Wisconsin)  
W78-11300

## 3. WATER SUPPLY AUGMENTATION AND CONSERVATION

### 3A. Saline Water Conversion

**PREPARATION OF COMPOSITE HOLLOW-FIBER REVERSE OSMOSIS MEMBRANES BY PLASMA POLYMERIZATION,**  
Research Triangle Inst., Research Triangle Park, NC.  
N. Morosoff.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 383.  
Price codes: A06 in paper copy, A01 in microfiche.  
Final Report RTI No. 31U-1085, August 1978. 112 p, 31 fig, 8 tab, 16 ref. S-0092(7537)(1).

Descriptors: Plasma polymerization, Glow discharge, Polymerization, \*Reverse osmosis membrane, \*Hollow fibers, \*Desalination processes, \*Membranes, \*Membrane processes, Polymers, Desalination apparatus.

A tandem plasma polymerization apparatus for continuous coating of hollow fibers has been built. The apparatus allows two treatments of a moving substrate to be carried out in successive chambers with no cross-contamination. The apparatus employs internal electrodes and can be used at a variety of frequencies. High flow rates can be achieved at low pressures. A study of the effects of changing plasma polymerization variables on the properties of the resultant plasma polymer has been carried out using tetrafluoroethylene in this apparatus. This system is unusually sensitive to power input and the plasma polymer is exceptionally easy to characterize by ESCA. Pressures below 100 millitorr have been indicated for appreciable deposition on the substrate. The distribution of plasma power density has been found to be non-uniform within the interelectrode gap in keeping with the known physics of glow discharges. The reverse osmosis properties of plasma polymer coated hollow fibers are described. Salt rejections of 87-93% have been achieved at fluxes of 1.5-4.0 g.f.d. with fiber take up rate of 50-100 cm/min. All plasma polymerization were studied at a frequency of 10 kHz using magnetic enhancement.

Pyridine and Acetylene + Nitrogen are the monomers employed. The reverse osmosis properties obtained were sensitive to the nature of the hollow fiber, presumably because of surface pore size.  
W78-10619

**HIGH STRENGTH CAST MODULES FOR SUPPORTING REVERSE OSMOSIS MEMBRANES.**  
Union Carbide Corp., New York. (Assignee)  
J. F. Meier, and J. D. B. Smith.  
U.S. Patent No 4,076,626, 8 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, no 4, p 1572, February 28, 1978.

Descriptors: \*Patents, \*Desalination, \*Reverse osmosis, \*Water treatment, \*Water quality control, Membrane processes, Separation techniques, Semipermeable membranes, Desalination apparatus.

The major advantage of reverse osmosis as a saline or contaminated water purification process is the low-energy requirements as compared to other processes. The function of a cell for the reverse osmosis process is to bring a saline or contaminated water solution at high pressure into contact with a supported semipermeable membrane. Problems of resin formulation shelf life and improved dry compressive and wet burst strengths are solved by using a low viscosity, 100% solids, solventless, latent catalyzed resin formulation, consisting essentially of: an admixture of a liquid epoxy resin, a liquid organic acid anhydride curing agent, a liquid diepoxide reactive diluent and a quaternary ammonium, phosphonium or arsonium salt latent catalyst, as a filter coating. The resin formulation is then used in casting a quantity filler particles and casting the coated filler. This provides, upon cure, a rigid hollow open pore strongly consolidated body, which is generally made in tubular form. This tube is especially strongly consolidated and suitable as a reverse osmosis membrane support having improved strength properties, i.e. wet burst strengths of at least 750 psi. (Sinha-OEIS)  
W78-10733

**ENERGY FROM SALT - A POSSIBILITY FOR ARID ZONE DEVELOPMENT,**  
Ben-Gurion Univ. of the Negev, Beersheba (Israel). Applied Research Inst.  
J. Schechter.  
Journal of Arid Environments, Vol. 1, No. 2, June 1978, p. 105-115, 6 fig, 2 pic, 17 ref.

Descriptors: \*Vapor pressure, \*Energy conversion, \*Saline water, \*Thermodynamics, \*Brines, Salts, \*Desalination, Aqueous solutions, Salinity, Water treatment, Saline water systems, Water quality, Treatment facilities, Free energy, Heat balance, Heat flow, Kinetics, Osmosis(Pressure retarded), Electrodialysis(Reversed), Arid lands.

Many arid and semi-arid regions are as deficient in energy sources as they are abundant in concentrated salts. This fact has stimulated scientists recently to investigate the possibility of extracting useful energy from salt deposits or from concentrated salt brines. Salt utilization for energy, as reviewed in here, relates not only to the common table salt, sodium chloride, but also to the other numerous dissolved sea minerals including magnesium and calcium chlorides and sulphates. Unlike solar energy, salt and saline water resources in arid regions are always available and easily stored. Thermodynamically, large quantities of free and useful energy is made available by the mining of a concentrated and a dilute solution. This study is so new, however that commercial equipment capable of utilizing this energy has yet to be developed. Basically the extraction of energy from the concentration difference of the two solutions is the opposite of water desalination processes. Just as energy is required to reduce salt concentrations in saline streams, energy is related from the process

of increasing the salt concentrations. Three processes to accomplish this task are discussed: Reversed electrodialysis, pressure retarded osmosis, and vapor pressure differential, all of which are the reverse of conventional desalination methods. Rapid progress is expected in perfecting these techniques into commercially accepted methods. While predictions are premature at this point, scientists are optimistic about this new-found energy source. (Tickes-Arizona) W78-10966

### PERFORMANCE IMPROVEMENT OF HORIZONTAL EVAPORATOR - CONDENSER DESALINATION UNITS.

Technician - Israel Inst. of Tech., Haifa. Dept. of Chemical Engineering. S. Sideman, D. Moalem, and R. Semiat. Desalination, Vol. 21, 1977, p. 221-233, 8 figs, 14 ref.

Descriptors: \*Desalination, \*Saline water-conversion, \*Salt extraction, Separation techniques, \*Desalination processes, Theoretical analysis, Water chemistry, \*Evaporator-condenser units, Water properties, \*Condensers, \*Evaporators, Desalination apparatus.

This study compares theoretical calculations with experimental result of Horizontal evaporator - condenser desalination units. This economically promising multiple-effect distillation process operates by simultaneous film evaporation outside and condensation inside horizontal tubes. All parameters were measured from an evaporator - condenser unit 2.4 m long and 0.8 m in diameter using deionized tap water rather than sea water to minimize scale deposition problems. Preliminary results indicate that major effects of the various parameters can be predicted by means of theoretical calculations; however, once drops falling onto the tubes causes the Reynolds number to go above 150, the models must be modified to account for the resulting ripples and waves. Additionally, the evaporating film Reynolds number and the nominal temperature driving force were found to have an insignificant effect upon the overall heat transfer coefficient. (Tickes-Arizona) W78-10970

### ENGINEERING ASPECTS OF GEOTHERMAL DEVELOPMENT WITH EMPHASIS ON THE IMPERIAL VALLEY OF CALIFORNIA.

California Inst. of Tech., Pasadena. Environmental Quality Lab.

For primary bibliographic entry see Field 4B. W78-11078

### WATER TREATMENT FOR SMALL PUBLIC SUPPLIES.

New Mexico State Univ., University Park. Dept. of Chemical Engineering. For primary bibliographic entry see Field 5F. W78-11208

### 3B. Water Yield Improvement

#### COMPRESSED AIR SEEDING OF SUPER-COOLED FOG.

Army Terrestrial Sciences Center, Hanover, NH. J. R. Hicks. Available from the National Technical Information Service, Springfield, VA 22161 as AD-A040 819. Price codes: A02 in paper copy, A01 in microfiche. Special Report 76-9, October 1976. 10 p, 1 fig, 3 tab, 1 ref.

Descriptors: \*Weather modification, \*Fog, \*Laboratory tests, Ice, Crystals, Drops (Fluids), Particle size, Measurement, Data processing, Meteorology, \*Compressed air.

Two series of experiments, 25 in a light fog and 25 in a heavy fog, were conducted in the CRREL cold cloud chamber. Compressed air was used to glaciate the -4C fog. The gage air pressure was 413.7 kPa. These tests showed that the number of ice crystals produced exceeded the number of water droplets in the fog by a factor of 21 for a light fog and 133 for a heavy fog. Approximately 2.6 times as many ice crystals were created in a heavy fog than were created in a light fog. (Sims-ISWS) W78-10931

### 3C. Use Of Water Of Impaired Quality

#### IRRIGATION WATER SALT CONCENTRATION INFLUENCES ON SEDIMENT REMOVAL BY PONDS.

Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center. For primary bibliographic entry see Field 5G. W78-10521

#### LYSIMETER MEASUREMENTS OF NITRATE AND CHLORIDE LOSSES FROM SOIL UNDER CONVENTIONAL AND NO-TILLAGE CORN.

Kentucky Univ., Lexington. Dept. of Agronomy. For primary bibliographic entry see Field 5B. W78-10590

#### SALINITY MANAGEMENT OPTIONS FOR THE COLORADO RIVER, DAMAGE ESTIMATES AND CONTROL PROGRAM IMPACTS.

Utah Water Research Lab., Logan. For primary bibliographic entry see Field 5G. W78-10735

#### SALINITY MANAGEMENT ALTERNATIVES FOR OIL SHALE WATER SUPPLIES.

Colorado State Univ., Fort Collins. Dept. of Economics. For primary bibliographic entry see Field 5G. W78-10825

#### ENERGY FROM SALT - A POSSIBILITY FOR ARID ZONE DEVELOPMENT.

Ben-Gurion Univ. of the Negev, Beersheba (Israel). Applied Research Inst. For primary bibliographic entry see Field 3A. W78-10966

#### STERILITY IN RICE CULTIVARS AS INFLUENCED BY MSMA RATE AND WATER MANAGEMENT.

Arkansas Agricultural Experiment Station, Stuttgart. Rice Branch Experiment Station. For primary bibliographic entry see Field 5B. W78-11053

#### PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME I. SUMMARY REPORT AND VERIFICATION.

Bureau of Reclamation, Denver, CO. Engineering and Research Center. For primary bibliographic entry see Field 5G. W78-11088

### 3D. Conservation In Domestic and Municipal Use

#### MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEM ANALYSIS - APPLICATION TO MEDIUM SIZE COMMUNITIES: URBAN STORM-DRAINAGE SYSTEMS PLANNING.

Purdue Univ., Lafayette, IN. Water Resources Research Center. For primary bibliographic entry see Field 6A.

W78-11058

#### CALIBRATION AND SENSITIVITY ANALYSIS OF THE CONTINUOUS RUNOFF SIMULATION MODEL 'STORM'.

Purdue Univ., Lafayette, IN. Water Resources Research Center. For primary bibliographic entry see Field 2A. W78-11060

#### MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND.

Colorado State Univ., Fort Collins. Dept. of Earth Sciences. For primary bibliographic entry see Field 4C. W78-11064

#### WATER SUPPLY AND CONTROL DEVELOPMENTS SUMMARIZED: ARIZONA.

From the State Capitals, p 1-2, September 1, 1978.

Descriptors: \*Water utilization, \*Water conservation, Artificial recharge, \*Arizona, Irrigation practices, Landscaping.

According to a study by the Arizona Water Commission, water conservation in Arizona can be achieved without financial hardship or major changes in lifestyle. The study said that prices currently charged for urban and most surface irrigation water are far below levels which would effect a meaningful long term reduction in use. It also said that the largest opportunity for urban water savings is through a reduction in outside use through improved irrigation practices and conversion to desert landscaping. Statistical comparisons show that industrial uses in Arizona are much lower than the national average, but that municipal water system uses are higher. The study discussed the legal implications of ground-water recharge as a means of water conservation. (Purdin-NWVA) W78-11076

#### SOME POLITICAL-INSTITUTIONAL FACTORS AFFECTING EFFORTS TO CONSERVE WATER IN WASHINGTON STATE.

Washington State Univ., Pullman. Dept. of Political Science. For primary bibliographic entry see Field 6E. W78-11212

### 3E. Conservation In Industry

#### A SURVEY OF POTENTIAL METHODS FOR RESOURCE RECOVERY FROM BLACK WATER OF THE UPPER GREEN RIVER BASIN.

Wyoming Univ., Laramie. Dept. of Mineral Engineering; and Wyoming Univ., Laramie. Graduate School. T. E. Phillips. Master of Science Thesis, May 1976. 80 p, 11 fig, 9 tab, 25 ref.

Descriptors: \*Water analysis, \*Analytical techniques, \*Oil shales, \*Water chemistry, \*Organic matter, \*Wyoming, Shales, Brines, Water pollution, Chemical analysis, Fossil fuels, Solvent extractions, Oil, Fuels, Water quality, Water types, Alkaline water, \*Black water, \*Resource recovery, \*Separation methods, \*Upper Green River Basin (Wyo), \*Eden Valley (Wyo).

Black water is found in the lean oil shales of the Upper Green River Basin of Wyoming. A variety of methods were examined for the separation of organic matter and salts from black water. Black water consists primarily of 5-8% organic acids and 4-6% sodium carboxylate and bicarbonate dissolved in water. The solution has a pH of 10. Acidifying



## Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

### Group 3E—Conservation In Industry

the black water solution to pH 3 precipitates the organic acids. The black water can be concentrated by evaporation of the water or by natural freezing. Both liquid-liquid extraction of the black water and leaching of the dehydrated black water with a wide range of polar and non-polar solvents do not appear to be effective methods of separating the organic acids from the salts. Retorting the black water under a carbon monoxide atmosphere converts the black water to a sodium bicarbonate solution and 44% of the original organic acid to a benzene soluble oil. (Henely-ISWS)  
W78-10534

**PURIFYING INDUSTRIAL EFFLUENTS AND ADSORPTION MATERIAL THEREFOR.**  
Ciba-Geigy, Basel (Switzerland).  
For primary bibliographic entry see Field 5D.  
W78-10672

**WATER RECOVERY AND EFFLUENT TREATMENT FOR THE PAPER INDUSTRY.**  
For primary bibliographic entry see Field 5D.  
W78-10687

**NEW GRAVITY SCREEN MAKES OF WASTEPAPER PRACTICAL AT PAPER MILLS,**  
Albany International Co., Glens Falls, NY.  
For primary bibliographic entry see Field 5D.  
W78-10692

**ENVIRONMENTAL PROBLEM OF BLEACHERIES (BLEKERIETS MILJOVARDSPROBLEM),**  
IVL-Konsult A.B., Stockholm (Sweden).  
For primary bibliographic entry see Field 5D.  
W78-10695

**CLOSED PROCESS WATER LOOP IN NSSC CORRUGATING MEDIUM MANUFACTURE,**  
Green Bay Packaging Inc., WI.  
For primary bibliographic entry see Field 5D.  
W78-10699

**METHOD FOR PRODUCING GEOTHERMAL ENERGY AND MINERALS,**  
Exxon Production Research Co., Houston, TX. (Assignee).  
L. D. Christian.  
U.S. Patent No. 4,074,754, 4 p, 1 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 955, February 21, 1978.

**Descriptors:** \*Patents, \*Geothermal studies, Boreholes geophysics, Thermal conductivity, Thermal properties, Temperature, Saline water, Energy transfer, Mineral water.

A method for producing geothermal energy and minerals from subterranean high temperature and high salinity water reservoirs is described. Low salinity water is injected at ambient surface temperature into the reservoir through a well bore. The injected water is allowed to become heated in the reservoir and then the water is produced through the well bore to the surface for use as a source of energy and, optionally, minerals. Simultaneously with the employment of certain wells for injection-production cycles, other wells may be employed predominantly for injection of water to displace heat and in-situ well brines to well bores which produce such water and brines to the surface for utilization of their heat energy and dissolved minerals. (Sinha-OEIS)  
W78-10715

**TREATMENT OF LIQUIDS CONTAINING COMPLEXED HEAVY METALS AND COMPLEXING AGENTS,**  
Photocircuits Corp., Glen Cove, NY. (Assignee)  
For primary bibliographic entry see Field 5D.  
W78-10726

**WATER SUPPLIES FOR INDUSTRIAL FIRE PROTECTION,**  
Peerless-Midwest, Inc., Granger, IN.  
For primary bibliographic entry see Field 4B.  
W78-11070

**THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS AND MINING OPERATIONS: AN OIL AND GAS LAWYER'S VIEW,**  
Hanna and Morton, Los Angeles, CA.  
For primary bibliographic entry see Field 5G.  
W78-11153

**THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS, AND MINING OPERATIONS: BITTERSWEET OR UNPALATABLE,**  
Saunders, Snyder, Ross and Dickerson, Denver, CO.  
For primary bibliographic entry see Field 5G.  
W78-11154

**GEOTHERMAL RESOURCE DEVELOPMENT IN TEXAS,**  
For primary bibliographic entry see Field 6E.  
W78-11161

**WATER SUPPLY DILEMMAS OF GEOTHERMAL DEVELOPMENT IN THE IMPERIAL VALLEY OF CALIFORNIA,**  
California Univ., Livermore. Lawrence Livermore Lab.  
D. W. Layton.

Paper presented to Twelfth American Water Resources Conference and Symposium, Chicago, Illinois, September 19-20, 1976. 21 p, 4 fig, 22 ref.

**Descriptors:** \*Imperial Valley(CA), \*Water supply, \*California, \*Geothermal energy, \*Electric powerplants, \*Cooling water, Geothermal studies, Groundwater, Colorado River, Imported water, Powerplants, Cooling towers, Salton Sea(CA), Salinity, Irrigation water, Water resources, Water management(Applied), Institutional constraints, Economics, Rivers, Inland seas, Alternative planning.

Although four of six known geothermal resource areas in California's Imperial Valley are exploitable for electrical power, with a combined potential of 4000-55000 megawatts sustainable for 25 years, serious water supply problems for cooling must be solved. Available water resources include: (1) water imported from the Colorado River, (2) agricultural waste waters, (3) water from the Salton Sea, (4) groundwater, and (5) steam condensate from the geothermal plants. Problems arising from geothermal development are: (1) institutional considerations, (2) water supply costs, (3) technical problems, and (4) environmental impact on the Salton Sea. To sustain 5500 mw of energy production, over 300,000 acre-feet of freshwater would be required for wet cooling towers, amounting to 10% of water annually diverted to the valley from the Colorado River, primarily for irrigation. Colorado River water salinity is the principal water quality problem in the valley; the water contains nearly 1.2 tons of salt/acre-foot. The geothermal resource areas in the valley suffer from thermal inefficiencies caused by low reservoir temperatures, producing more waste heat per unit of electrical output and greater need for cooling water. Constraints on obtaining more water will mainly be determined by the quantity of irrigation water allocated by the Imperial Irrigation District to geothermal projects and potential subsidence control policies. The consequences of each alternative are evaluated. (Lynch-Wisconsin)  
W78-11299

### 3F. Conservation In Agriculture

**A PHYSICALLY-BASED MODEL TO PREDICT RUNOFF UNDER VARIABLE RAIN INTENSITY,**  
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.  
For primary bibliographic entry see Field 2G.  
W78-10525

**PREDICTED AND MEASURED DRAINABLE POROSITIES FOR FIELD SOILS,**  
North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering.  
For primary bibliographic entry see Field 2G.  
W78-10526

**CHARACTERIZATION OF YIELD AND ECONOMIC LOSS FROM NONUNIFORM FERTILIZER DISTRIBUTION USING COMPUTER SIMULATION,**  
Nebraska Agricultural Experiment Station, Lincoln.  
R. C. Sorensen, and R. A. Wiese.  
Soil Science Society of America Journal, Vol 41, No 2, p 382-385, March-April, 1977. 4 fig, 2 tab, 10 ref.

**Descriptors:** Model studies, \*Simulation analysis, Computer programs, \*Fertilizers, \*Fertilization, Nutrients, \*Crop production.

A simple computer program has been developed to predict yield losses from uneven broadcast fertilizer distribution on the basis of distribution pattern, yield response curve, fertilizer distribution on the basis of distribution pattern, yield response curve, fertilizer rate, soil test rating and amount of fertilizer swath overlap. Losses were serious only on soils classed 'very low' in nutrient supply. Losses for a highly responsive crop are less than for a less responsive crop. Overlapping succeeding swaths may improve the appearance of a field, but has a small effect on yield loss unless the amount of overlap is greater than 50%. Visually evident streaks in plant growth patterns may not necessarily indicate high yield loss. (Skogerboe-Colorado State)  
W78-10595

**DECOMPOSITION OF RICE STRAW IN SOILS AS AFFECTED BY SOME MANAGEMENT FACTORS,**  
California Univ., Davis. Dept. of Land, Air, and Water.  
For primary bibliographic entry see Field 2G.  
W78-10597

**ASSESSING TWO DIAGNOSTIC METHODS FOR ENUMERATION OF NITRATE REDUCING AND DENITRIFYING BACTERIA IN SOIL-PLANT ROOT ASSOCIATIONS,**  
Connecticut Agricultural Experiment Station, New Haven.  
For primary bibliographic entry see Field 2G.  
W78-10599

**A STEADY-STATE CONCEPTUAL NITROGEN MODEL FOR ESTIMATING NITROGEN EMISSIONS FROM CROPPED LANDS,**  
Joint FAO/IAEA Div. of Atomic Energy in Agriculture, Vienna (Austria).  
For primary bibliographic entry see Field 5B.  
W78-10601

**BORDER-IRRIGATION HYDRAULICS WITH ZERO INERTIA,**  
California Univ., Davis. Dept. of Land, Air, and Water.  
T. Strelkoff, and N. D. Katopodes.



Journal of the Irrigation and Drainage Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. IR3, p 325-342, September 1977. 7 fig, 19 ref.

Descriptors: \*Border irrigation, \*Surface irrigation, Irrigation, \*Irrigation practices, Irrigation systems, Irrigation engineering, \*Model studies.

A model of border irrigation based on the Saint-Venant equations with the acceleration (inertia) terms deleted has been constructed. For the test cases presented, agreement with more complex (and costly) models and with experiment has been satisfactory. (Skogerboe-Colorado State) W78-10604

**ALGEBRAIC COMPUTATION OF FLOW IN BORDER IRRIGATION,**  
California Univ., Davis. Water Science and Engineering Section.  
T. Strelkoff.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol. 103, No. IR3, p 357-377, September 1977. 10 fig, 6 ref.

Descriptors: \*Border irrigation, \*Surface irrigation, \*Model studies, Simulation analysis, Infiltration, Irrigation design.

The elements of a model of surface irrigation in a border have been presented. A sufficient number of physical assumptions have been made to allow the phenomena to be described by algebraic equations. This involves adaptation of simple shapes to both the surface and subsurface profiles. The absolute value of depth at key point in the surface profile is related to discharge through assumption that the depth is normal. In the subsurface profile, the depth at key points is related to the time water has been available there for infiltration through an infiltration-time formula. (Skogerboe-Colorado State) W78-10605

**IMMOBILIZATION OF FERTILIZER NITRATE APPLIED TO A SWELLING CLAY SOIL IN THE FIELD,**  
Texas Agricultural Experiment Station, Temple.  
For primary bibliographic entry see Field 2G. W78-10607

**PHOSPHORUS SORPTION CHARACTERISTICS OF FLOODED SOILS,**  
Louisiana State Univ., Baton Rouge. Center for Wetland Resources.  
For primary bibliographic entry see Field 2G. W78-10610

**EFFECT OF REDOX POTENTIAL AND PH ON THE UPTAKE OF CADMIUM AND LEAD BY RICE PLANTS,**  
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.  
For primary bibliographic entry see Field 2K. W78-10614

**THE POTENTIAL PRIMARY PRODUCTIVITY OF PENINSULAR MALAYSIA,**  
Guelph Univ. (Ontario), Dept of Geography.  
For primary bibliographic entry see Field 2D. W78-10650

**METHODOLOGY AND EMPIRICAL ESTIMATES OF THE RESPONSE FUNCTION OF SORGHUM TO IRRIGATION AND SOIL MOISTURE,**  
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soil and Water.  
H. Bielorai, and D. Yaron.  
Water Resources Bulletin, Vol 14, No 4, p 966-977, August 1978. 3 tab, 4 fig, 17 ref.

Descriptors: \*Methodology, \*Irrigation, \*Soil moisture, \*Sorghum, \*Crop response, Estimating, Equations, Systems analysis, Response function, Critical days.

Presented is a methodology for the estimation of response functions of crops to irrigation and soil moisture. A systems analysis framework is applied to describe the relationships involved. Two subsystems are distinguished, with the first one involving the relationship between irrigation decision variables and soil state variables, and the second involving the relation between soil state variables and crop yield. A method for tracing and predicting soil moisture profile variations over time and depth is presented, and empirical estimates of the response function of grain sorghum to soil moisture are derived. In the specification of the response function the concept of 'critical days' is applied with a 'critical day' being defined as one where the soil moisture is depleted below a certain critical level. The paper provides empirical evidence for the usefulness of the approach. (Bell-Cornell) W78-10659

**DRIP LEVEL IRRIGATION,**  
Hydro-Plan Engineering Ltd., Tel-Aviv. (Israel). (Assignee).  
R. Mehoudar.  
U. S. Patent No. 4,060,200, 7 p, 15 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 964, No 5, p 1495, November 29, 1977.

Descriptors: \*Patents, \*Irrigation, \*Irrigation practices, \*Irrigation efficiency, Flow control, Application equipment, Drip irrigation.

Drip level irrigation installations using conduits which are relatively thin waled and can therefore be mass produced at relatively low cost are designed for one-season use after which they can be replaced by new installations. In view of the flimsy nature of the disposal conduit it has been found to be extremely difficult to couple any of the known forms of emitter units with which a controlled pressureless discharge rate can be obtained. It is an object of this invention to provide for a new and improved emitter unit which can be readily coupled to a relatively flimsy conduit. A process for the production of a drip level irrigation conduit comprises the steps of: dispensing an elongated, substantially rectangular flexible strip; coupling constituent components of successive emitter drip units to each other via the interposed strip at spaced apart intervals; effecting flow communication through the strip; and bonding the longitudinal edges of the strip so as to form a conduit. The components can be suitably press fastened to each other through the strips. In this way the portion of the strip which separates the two components can itself constitute a wall which serves to define, with the elongated groove formed in the unit, a flow restricting flowpath. (Sinha-OEIS) W78-10702

**WATE GATE CONTROL SYSTEM,**  
T. Nomura.  
U.S. Patent No. 4,073,147, 10 p, 7 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 422, February 14, 1978.

Descriptors: \*Patents, \*Irrigation, \*Water control, \*Flow control, Irrigation systems, Irrigation practices, Irrigation efficiency, Water level, Equipment, Water gates.

The water gates of the type described are widely used to raise the level of a stream for securing water for irrigation or industrial purposes. In general, the gate is usually held in upright position, but when the level of a stream or water-way exceeds a predetermined level, the gate is swung to the downstream direction to permit the discharge of excess water. A water gate control system selects either the automatic mode or forced mode.

In the automatic mode the gate is automatically swung depending upon the level of a stream between the upright or closing position and the flat or opening position by a single- or double-acting hydraulic cylinder in which a directly or indirectly spring loaded piston is displaced depending upon the hydraulic pressure acting on the gate. In the forced mode, the working oil under pressure is introduced into the hydraulic cylinder for swinging the gate to and holding it in a desired angular position independently of the water level. (Sinha-OEIS) W78-10705

**IRRIGATION APPARATUS,**  
Harold (Raymond D.), Walla Walla, WA. (Assignee).  
A. D. Fraser, and D. A. Inglis.  
U.S. Patent No. 4,073,309, 13 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 475, February 14, 1978.

Descriptors: \*Patents, \*Irrigation, \*Irrigation systems, Irrigation efficiency, Irrigation practices, Application equipment, Conveyance structures, Control systems, Electronic equipment.

A pivotal irrigation system consists of end-coupled adjacent irrigation pipes extending radially outward from a pivot center. Each of the sections is supported by a tower driven by some type of drive means causing the system to rotate around the pivot point. This invention is a control system for maintaining the linear alignment of the irrigation apparatus, and for interrupting power to the drive means when any adjacent sections are in gross linear misalignment uncorrectable by the control system. A magnetic reed switch and permanent magnet combination, together with a metallic shield interposed between them, act as alignment sensors and overtravel sensors to open or close the reed switch in accordance with the alignment status of the irrigation system. A logic circuit utilizing an exclusive OR-gate is disclosed which causes the function of the alignment control sensors to reverse whenever the direction of the irrigation apparatus reverses, and also, an electronic circuit utilizing a digital capacitance meter to indicate which tower is in gross linear misalignment, if any, should the apparatus automatically shut down. (Sinha-OEIS) W78-10706

**SPRINKLER HEAD,**  
Nelson Irrigation Corp., Walla Walla, WA. (Assignee).  
L. P. Meyer.  
U.S. Patent No. 4,073,438, 8 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 519, February 14, 1978.

Descriptors: \*Patents, \*Irrigation, \*Sprinkler irrigation, Irrigation efficiency, Irrigation practices, Application equipment.

A sprinkler head utilizes a ball and socket type assembly for connecting a nozzle type water distributing structure within a sprinkler body structure for rotational movement about an upright axis and for orbital movement in which the rotational axis of the water distributing structure describes a pair of cones whose apexes join at a point coinciding with the center of the ball and socket assembly, the latter also serving as a liquid-tight seal for a water chamber within the sprinkler body structure in communication with the inlet of the water distributing structure. Within the chamber in operative relation with the water distributing structure is a simple structural arrangement operable by the internal flow of water to effect the orbital movement of the water distributing member. The preferred form of the orbiting arrangement consists of a swirl plate within the chamber and an integral inverted cup-like portion on the lower end of a tabular water distributing nozzle member which is moved orbitally by the swirling motion of

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the water established by the swirl plate. (Sinha-OEIS)  
W78-10707

**WATER DRIVE SYSTEM FOR A CENTER PIVOT IRRIGATION UNIT OR THE LIKE**, Lindsay Mfg. Co., NE. (Assignee).  
K. E. Arndt, L. E. Otto, Jr., and D. A. Sickmeier.  
U.S. Patent No. 4,074,783, 10 p, 7 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 964, February 21, 1978.

Descriptors: \*Patents, \*Irrigation, \*Irrigation systems, Irrigation practices, Irrigation efficiency, Hydraulic systems, Application equipment.

A water drive system for a center pivot irrigation system has a string of pipe which pivots in a circle or oscillates about a center pivot or upright with the pipe supported on towers at intervals. Each tower is independently driven by a power mechanism which is operated by the pressure of the water in the string of pipe. It includes a mechanism to prevent one or more towers from rolling ahead on a downhill slope, a diaphragm valve arrangement for controlling the cycling of the drive, and an enlarged bellows or bladder for operating the water drive mechanism. (Sinha-OEIS)  
W78-10716

**GREENHOUSE WATERING APPARATUS**, Union Carbide Copr., New York. (Assignee).  
D. Williams, B. A. Lentz, and H. E. LeVeque.  
U.S. Patent No. 4,074,856, 14 p, 13 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 991, February 21, 1978.

Descriptors: \*Patents, \*Irrigation, \*Greenhouses, \*Irrigation practices, \*Irrigation efficiency, Water conveyance, Water delivery, Structures, Application equipment.

The greenhouse watering apparatus includes a horizontally and longitudinally placed support member which may be a straight cylindrical pipe suspended from the roof of the greenhouse. A carriage has a yoke at its upper end with trolley wheels mounted to roll on two opposite upper surface portions of the support member. The wheels roll along paths located on opposite sides of the suspension means for the support member, so that the suspension does not interfere with back-and-forth travel of the carriage. An electric motor is supported by the carriage for rotating a drive wheel in engagement with the bottom of the support member to provide carriage travel in both directions along the support member. A hose reel is mounted on the carriage and has a central pipe with an inlet fitting to which a liquid-supplying hose is secured. Valves are provided to enable each boom to be used separately from the other, so that one boom sprays one half of the greenhouse while the carriage moves in one direction, and the other boom sprays the other half while the carriage moves in the opposite direction. This serves to prevent overwatering at the ends of the greenhouse. (Sinha-OEIS)  
W78-10717

**EXTREME EVAPOTRANSPIRATION BY IRRIGATED ALFALFA: A CONSEQUENCE OF THE 1976 MIDWESTERN DROUGHT**, Nebraska Univ., Lincoln. Agricultural Meteorology Section.  
For primary bibliographic entry see Field 2D.  
W78-10923

**WATERWEEDS: FLIES IN THE IRRIGATION OINTMENT**,  
For primary bibliographic entry see Field 4A.  
W78-10969

**SYRIA'S EUPHRATES DAM PROMISES RAPID AGRICULTURAL DEVELOPMENT**, S. Pitcher.  
Foreign Agriculture, Dec. 23, 1974, Vol. 12, NSI, p 14-16. 6 photos.

Descriptors: \*Irrigation programs, \*Resettlement, \*Dams, Post project analysis, Water resources development, Water management, \*Syria(Euphrates River), Cotton, Crop production, Rotations, Wheat, Reservoirs, \*Tabaqah Dam(Syria).

Completion of the Tabaqah Dam in 1973 has brought several years closer the objective of increasing Syria's irrigated land by one third. The Dam's reservoir, Lake Assad, will have a surface area of 243 sq. miles, and irrigate 1.6 million acres of land in six regions, but full use of the system awaits development of irrigation systems and new farm land, and resettlement of displaced villages. A pilot project in Balikh basin indicates that with the water made available and the introduction of modern farming methods, crop yields of wheat and cotton can be increased up to 40 percent. Funding for the project came from the World Bank and the Syrian Government, with the Soviet Union providing the major material, financial, and technical input for building the structure itself. Newly irrigated areas will be farmed cooperatively by resettlement villages financed by the Syrian Government, together with assistance from UNICEF and the World Food Program. The new availability of water, together with crop rotation and improved strains will eventually help put a brake on the ancient dependence of farm productivity on rainfall fluctuations. (Tickes-Arizona).  
W78-10976

**DROUGHT AND THE NIGERIAN FARMER**, Ibadan Univ. (Nigeria). Dept. of Geography.  
For primary bibliographic entry see Field 2B.  
W78-10979

**PROBABLE MAXIMUM RAINFALL FOR CONDITIONS OF IRAQ**, Ministry of Irrigation, Baghdad (Iraq).  
For primary bibliographic entry see Field 2B.  
W78-10980

**A PORTABLE CHAMBER FOR RAPID EVAPOTRANSPIRATION MEASUREMENTS ON FIELD PLOTS**, South Carolina Agricultural Experiment Station, Florence.  
For primary bibliographic entry see Field 2D.  
W78-11028

**DRIP/TRICKLE PIPE NETWORK DESIGN**, A. G. Water, Shafter, CA.  
F. Hamisch.  
Drip/Trickle Irrigation, Vol 2, No 1, p 23-26, January/February 1977. 1 fig, 1 tab.

Descriptors: Irrigation engineering, Irrigation systems, \*Irrigation design, Hydraulics, Hydraulic design, Head loss, Friction, Flow rates, Networks, Distribution systems.

The piping network is the means for taking water from its source and delivering it to the emitter in adequate amounts and with the appropriate pressure. The design of this system must be made from a sound engineering approach. The total system must be the most cost effective for the particular application. The least initial capital cost frequently is not the least expensive system for the user. The addition of higher pressures and their related annual operating costs may exceed the initial savings of the 'least expensive' system in a short time. Power, water, and other costs are rising rapidly, and it is the designer's responsibility to consider the total costs. (Skogerboe-Colorado State)  
W78-11030

**ON THE ALLOCATION OF PRIME AGRICULTURAL LAND**, Harza Engineering Co., Chicago, IL.  
J. A. Gibson.  
Journal of Soil and Water Conservation, Vol 32, No 6, p 271-275, November-December 1977. 27 ref.

Descriptors: Land, Land classification, Land development, \*Land management, Land resources, \*Land use, \*Agriculture, Environment, Environmental control, \*Economics, Urbanization.

How land is used in the future likely will vary considerably from how land should be used according to economic theory. Asymmetry characterizes the effectiveness and efficiency of our system of economic incentives. A major part of land use is formed by the sum of many individual local actions. The present market system stimulates the exploitation of land resources very well, but it fails almost completely with respect to preservation. For example, climate, topography, and soils exert almost important effects upon the use of land for agricultural purposes. The location factor is of little significance for agriculture in the absence of a suitable physical base. (Skogerboe-Colorado State)  
W78-11031

**STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS--I. DISTRIBUTION OF IMMOBILIZED NITROGEN AMONGST SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY**, Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.  
For primary bibliographic entry see Field 2K.  
W78-11032

**STUDIES OF NITROGEN IMMOBILIZATION AND MINERALIZATION IN CALCAREOUS SOILS--II. MINERALIZATION OF IMMOBILIZED NITROGEN FROM SOIL FRACTIONS OF DIFFERENT PARTICLE SIZE AND DENSITY**, Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils.  
For primary bibliographic entry see Field 2K.  
W78-11033

**SOIL MICROBIAL AND BIOCHEMICAL CHARACTERISTICS IN RELATION TO SOIL MANAGEMENT AND FERTILITY**, Ghent Rijksuniversiteit (Belgium). Dept. of General and Industrial Microbiology.  
For primary bibliographic entry see Field 2G.  
W78-11035

**NITROGEN AND PHOSPHORUS MOVEMENT FROM AGRICULTURAL WATERSHEDS**, Agricultural Research Service, Columbia, CO.  
For primary bibliographic entry see Field 5B.  
W78-11040

**MEASURING THE AMOUNTS OF CROP RESIDUE REMAINING AFTER TILLAGE**, Agricultural Research Service, Morris, MN.  
L. L. Sloneker, and W. C. Moldenhauer.  
Journal of Soil and Water Conservation, Vol 32, No. 5, p 231-236, September-October, 1977. 6 fig, 5 tab, 10 ref.

Descriptors: \*Cultivation, \*Mulching, \*Crop production, Organic matter, Soils, Soil investigations.

A simple method of estimating percent residue cover, and how to convert percent residue cover to tons per acre was devised. Under certain conditions, more than one fall mulch tillage operation

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can be performed without losing a large percentage of residue cover. The percentage of cover remaining after row-crop planting using various tillage methods on different soils at three locations was also determined. (Skogerboe-Colorado State) W78-11041

**FACTORS INFLUENCING THE LOSS OF ORGANIC CARBON FROM WHEAT ROOTS.** Commonwealth Scientific and Industrial Research Organization, Glen Osmond (Australia). Div. of Soils. For primary bibliographic entry see Field 2G. W78-11042

### EMITTER SELECTION,

L. Gladigau. Drip/Trickle Irrigation, Vol. 2, No. 1, p 11-15, January/February 1977. 2 fig, 1 tab.

Descriptors: \*Irrigation efficiency, \*Irrigation engineering, Irrigation systems, Irrigation design, Hydraulics, Hydraulic design, Head loss, Friction, Flow rates.

Initially, emitter selection depends on the soil, plant requirement, emitter discharge, water quality, and terrain of a particular location. Evaluation will also include emitter cost and system risks. Generally, the emitters offering the more desirable features and lower system risks have a higher unit cost. The initial emitter considered will have an influence on the cost of the mainline and filtration system and may need to be reevaluated before a final selection is made. (Skogerboe-Colorado State) W78-11044

**SOURCES, RATES, AND FREQUENCIES OF N APPLICATION IN SUBIRRIGATED HAY MEADOWS.** Nebraska Univ., Lincoln. Dept. of Agronomy. L. A. Daigger, and W. J. Moline. Agronomy Journal, Vol. 69, No. 4, p 644-647, July-August 1977. 4 fig, 2 tab, 10 ref.

Descriptors: \*Subsurface irrigation, Irrigation systems, \*Nitrogen, Fertilizers, Fertilization, \*Nutrients, Soil investigations, Urea, \*Application rates.

Inadequate supplies of soil nutrients often limit hay production of western United States subirrigated meadows. The effectiveness was evaluated of three N-sources at various rates in alternating sequences of N-applied annually, biennially, and triennially for meadow hay production. (Skogerboe-Colorado State) W78-11046

**3-WHEEL 'MOSQUITO' IRRIGATES FROM DITCH.** J. White. Irrigation Age, Vol. 11, No. 7, p 80-81, 86, April, 1977. 2 fig.

Descriptors: Irrigation, Irrigation systems, \*Irrigation practices, \*Irrigation efficiency, \*Equipment.

A farmer has designed a self-propelled irrigation 'tractor' that looks similar to a mechanical mosquito. The 'Mosquito' combines the advantages of circular pivot irrigation systems with the low cost of gravity irrigation. This new machine has helped increase yields on corn, wheat, barley and lettuce, the primary crops in the San Luis Valley in Southern Colorado, because the 'Mosquito' provides more efficient use of water. The 'Mosquito' also requires less supervision than some other irrigation systems. (Skogerboe-Colorado State) W78-11047

**AUTOMATION ASSURES PRECISE DELIVERY, CUTS LABOR.** Irrigation Age, Vol. 11, No. 8, p 31-32, May-June, 1977. 1 fig.

Descriptors: \*Automation, Irrigation, Irrigation systems, \*Irrigation practices, \*Irrigation efficiency, Arizona.

A study was undertaken in the Wellton-Mohawk Valley area to automate two common methods of turning water into a field/jack-gates and tile outlets. Farmers who grow wheat, alfalfa or cotton in the Wellton-Mohawk Valley operate on fairly tight soils, either clay loams or silty clay loams. Fields are generally dead-leveled (level basins) and jack-gates and tile outlets were used. Both types of systems could be successfully automated. However, jack-gates have been more effective. (Skogerboe-Colorado State) W78-11048

**NITRATE DISTRIBUTION AND VARIABILITY IN IRRIGATED FIELDS OF NORTHEASTERN COLORADO.** Colorado State Univ., Fort Collins. Dept. of Agronomy.

A. E. Ludwick, P. N. Soltanpour, and J. O. Reuss. Agronomy Journal, Vol. 69, No. 4, p 710-713, July-August, 1977. 1 fig, 6 tab, 16 ref.

Descriptors: \*Nitrates, Irrigation, \*Irrigation effects, \*Colorado, Fertilizers, \*Fertilization, \*Nitrogen, Nutrients, Soil profiles, Sampling, Water pollution sources.

Fertilizer N recommendations in the Great Plains and Western United States are commonly based on soil NO<sub>3</sub>- tests, although NO<sub>3</sub>- content within soil profiles is subject to rapid change. The purpose of this study was to evaluate NO<sub>3</sub>- distribution within diverse soil profiles and determined NO<sub>3</sub>- changes occurring over winter. Twenty-six irrigated farm fields were systematically sampled in 1974 and 1975 by dividing them into 61 x 61 m grids (0.37 ha) and sampling to a 120-cm depth by 30-cm increments. Eleven fields were resampled for fall versus spring comparisons. Nitrate content tended to be greatest in the surface 30-cm and decrease with depth; only three fields deviated markedly from the general pattern. (Skogerboe-Colorado State) W78-11049

**SAMPLING DISTRIBUTION OF NITRATES IN IRRIGATED FIELDS.** Colorado State Univ., Fort Collins. Dept. of Agronomy.

J. O. Reuss, P. N. Soltanpour, and A. E. Ludwick. Agronomy Journal, Vol. 69, No. 4, p 588-592, July-August 1977. 2 fig, 5 tab, 12 ref.

Descriptors: \*Sampling, \*Nitrates, Irrigation, Irrigation effects, \*Irrigation practices, Colorado, Nebraska, Laboratory tests, Fertilizers, Fertilization.

The object was to determine the components of variability encountered in sampling farmers' fields for soil nitrates. This information is required for formulating recommendations for sampling plan and intensity. Twenty-four irrigated farm fields in northeastern Colorado and Western Nebraska were sampled on 61 x 61 m grids. One soil core was taken in 30-cm increments from each grid to a depth of 120 cm. Duplicate cores were obtained from each third grid to allow determination of within grid variability. The laboratory-induced variability was also estimated. The results indicated that within and among grid standard deviations increased as the means increased. The standard errors of laboratory determinations (subsampling plus analytical errors) also increased as the means increased. (Skogerboe-Colorado State) W78-11051

**WATER RELATIONS OF COTTON. II. CONTINUOUS ESTIMATES OF PLANT WATER POTENTIAL FROM STEM DIAMETER MEASUREMENTS.** Agricultural Research Service, Auburn, AL. M. G. Huck, and B. Klepper. Agronomy Journal, Vol. 69, No. 4, p 593-597, July-August, 1977. 3 fig, 19 ref.

Descriptors: \*Cotton, Sampling, Crop response, \*Plant growth, \*Plant physiology, Plant population.

Information about plant water potential is often required at very frequent intervals in studies with small numbers of plants. Two methods for inferring plant water potential continuously and non-destructively are described for cotton plants. Both methods require continuous monitoring of stem diameter and occasional destructive sampling of tissue for determination of water potential by conventional methods. The computed results are compared with experimental measurements of plant water potential. (See also W76-00804) (Skogerboe-Colorado State) W78-11055

**LARGE CROP YIELD IS A MAJOR GOAL OF IRRIGATION.** Universal Oil Products, Inc., Saint Paul, MN. Johnson Div. T. L. Davis. The Johnson Drillers Journal, Vol. 50, No. 3, p 1-4, May-June, 1978.

Descriptors: \*Irrigation systems, \*Crop production, \*Sprinkler irrigation, \*Gravity irrigation, Infiltration rates, \*Soil moisture.

The ultimate use of irrigation is to assure maximum crop yields rather than prevent crop loss. There is greater certainty of maximum yields and improved quality when adequate moisture is present in the soil at planting and during fertilization. Irrigation systems fall into two categories: gravity systems and sprinkler systems. Sprinkler systems can be used on sloping land and can be adapted to any water intake rate. Other factors to consider in selecting an irrigation system are: type of crop, cost, shape of the area, amount of crop land, and wind conditions. Sprinkler systems are growing in popularity since they are more efficient. The most popular type are: solid set, side-wheel-roll, traveling gun, center pivot, and 'trickle' sprinkler systems. Good irrigation management requires knowing when and how much water to apply. Certain plants can be used as indicators of low soil moisture conditions, but it is better to use electrical resistance, tensiometers, soil probes or even 'feel'. A third method is to estimate crop water use from tables. Preventive maintenance is another aspect of good management. If ground water is used, well records should be kept. The decision whether or not to irrigate ultimately depends on the cost-benefit ratio. (Purdin-NWWA) W78-11068

**THE TWO-TIERED MARKET IN WESTERN WATER.** New Mexico Univ., Albuquerque. School of Law. For primary bibliographic entry see Field 6E. W78-11157

**GENERAL RULES GOVERNING IRRIGATION.** For primary bibliographic entry see Field 6E. W78-11184

**THE IMPACT OF ENERGY RESOURCE DEVELOPMENT ON WATER RESOURCE ALLOCATIONS.** Utah Water Research Lab., Logan. For primary bibliographic entry see Field 6B. W78-11211



## Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

### Group 3F—Conservation In Agriculture

**SOME POLITICAL-INSTITUTIONAL FACTORS AFFECTING EFFORTS TO CONSERVE WATER IN WASHINGTON STATE,** Washington State Univ., Pullman. Dept. of Political Science.  
For primary bibliographic entry see Field 6E.  
W78-11212

**WATER PROBLEMS IN THE RURAL ENVIRONMENT--ALTERNATIVE SOLUTIONS FOR WATER SUPPLY AND WASTEWATER DISPOSAL.** Proceedings of a Conference on November 4, 5, 1976, Lincoln, Nebraska, Institute of Agriculture and Natural Resources, Lincoln, Nebraska. 136 p.

Descriptors: \*Institutional constraints, \*Rural sociology, \*Water supply, \*Waste water disposal, Agriculture, Legal aspects, Legislation, Regulation, Nebraska, Rural areas, Water law, Water management(Applied), Water quality, Water requirements, Water resources, Water rights, Water sources, Water utilization.

Providing an adequate supply of safe water for rural residents has been a long-term problem in the United States as well as in most countries of the world. Renewed growth of non-urban populations and increasing per capita use of water are constraining the capacity of many rural water systems to provide adequate service. The biggest problems for local communities are regulation and financing. Regulations pertaining to facility design, operations and output have been taken care of at the state and federal level. This has meant the imposition of standards which may be quite legitimate and necessary, but which communities cannot meet with their financial resources. A problem peculiar to rural water systems is that of scale. For rural water systems, small size tends to preclude the attainment of potential economies of scale in source of supply, transmission, and treatment. The cost of supplying safe drinking water in rural areas will remain large. However, the supply of water can be used to shape plans and develop residential regions, natural resources, and industries. This conference examines the water problem encountered by rural communities and the various technological alternatives available to ensure adequate water supplies. (Jordan-Florida)  
W78-11244

**WATER SUPPLY DILEMMAS OF GEOTHERMAL DEVELOPMENT IN THE IMPERIAL VALLEY OF CALIFORNIA,** California Univ., Livermore. Lawrence Livermore Lab.  
For primary bibliographic entry see Field 3E.  
W78-11299

#### 4. WATER QUANTITY MANAGEMENT AND CONTROL

##### 4A. Control Of Water On The Surface

**WATER DISCHARGE OF RIKHA SAMBA KHOLA IN HIDDEN VALLEY, MUKUT HIMAL,** Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.  
For primary bibliographic entry see Field 2C.  
W78-10506

**OPTIMAL IDENTIFICATION OF NONLINEAR SURFACE RUNOFF SYSTEMS WITH COPOSITIVITY THRESHOLD CONSTRAINTS,** Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Industrial and Management Engineering.  
For primary bibliographic entry see Field 2E.

W78-10515

**A PHYSICALLY-BASED MODEL TO PREDICT RUNOFF UNDER VARIABLE RAIN INTENSITY,** Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.  
For primary bibliographic entry see Field 2G.  
W78-10525

**THE PHYSIOGRAPHIC INFLUENCE ON RECESSION RUNOFF IN SMALL NORWEGIAN RIVERS,** Norsk Inst. for Vannforskning, Blindern. T. Tjomsland, E. Ruud, and K. Nordseth. *Nordic Hydrology*, Vol 9, No 1, p 17-30, 1978. 5 fig, 2 tab, 22 ref, 2 append.

Descriptors: \*Runoff, \*Water storage, \*Lakes, \*Rivers, Watersheds(Basins), Drainage, Regression analysis, Correlation analysis, Discharge(Water), Bedrock, Hydrology, Geology, \*Norway.

This paper presented a statistical correlation procedure to predict a master depletion curve by use of basin characteristics and the specific storage of water available for runoff at a particular recession discharge in small watersheds. Percentual lake area, drainage density, and a weighted lake inflow area index were the most significant parameters to explain differences in specific storage among basins. The significance showed time-dependency. Percentual lake area had a decreasing contribution to a total explanation from high to low specific discharges, while drainage density increased its importance. (Sims-ISWS)  
W78-10528

**BORDER-IRRIGATION HYDRAULICS WITH ZERO INERTIA,** California Univ., Davis. Dept. of Land, Air, and Water.  
For primary bibliographic entry see Field 3F.  
W78-10604

**ALGEBRAIC COMPUTATION OF FLOW IN BORDER IRRIGATION,** California Univ., Davis. Water Science and Engineering Section.  
For primary bibliographic entry see Field 3F.  
W78-10605

**SURFACE WATER RECORDS OF COOK INLET BASIN, ALASKA, THROUGH SEPTEMBER 1975,** Geological Survey, Anchorage, AL. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10621

**LOW-FLOW FREQUENCY OF GEORGIA STREAMS,** Geological Survey, Doraville, GA. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-10623

**FLOOD PROFILES FOR LOWER BROOKER CREEK, WEST-CENTRAL FLORIDA,** Geological Survey, Tallahassee, FL. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-10624

**WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1976,** Geological Survey, Raleigh, NC. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10627

**WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1977,** Geological Survey, Towson, MD. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10628

**WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1977,** Geological Survey, Carson City, NE. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10629

**FLOOD FREQUENCY ANALYSIS WITH A GENERALIZED SKEW COEFFICIENT,** Geological Survey, Reston, VA. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-10639

**RESERVOIR STORAGE WITH DEPENDENT, PERIODIC NET INPUTS,** Geological Survey, Denver, CO. Water Resources Div.  
B. M. Troutman.  
Water Resources Research, Vol 14, No 3, p 395-401, June 1978. 5 fig, 20 ref.

Descriptors: \*Reservoirs, \*Reservoir storage, \*Storage capacity, \*Projections, \*Stochastic processes, Inflow, Water demand, Time series analysis, Seasonal, Storms, Droughts, Autoregressive inflows, Asymptotic distributions, Brownian motion, Deficit analysis, Dependent inflows, Hurst phenomenon, Periodic inflows, Range of cumulative sums, Sequent peak method, Serial correlation of inflows.

Two random quantities, the range and the maximum deficit, which may provide a measure of the required storage capacity of a reservoir over a fixed length of time, are considered. Interest in the range from an engineering point of view was initiated by Hurst (1951), who demonstrated that for certain geophysical time series, sample values of the range exhibit a property that has subsequently become known as the 'Hurst phenomenon'. This property is discussed briefly, primarily with the intention of showing that the Hurst phenomenon can be interpreted so as to be consistent with the asymptotic results on the range. The second quantity, the maximum deficit, is simply the storage obtained when one applied the sequent peak algorithm. Of primary concern is the manner in which the statistical behavior of these quantities is affected by dependence and periodicity in the net inputs to the reservoir. Dependence, sometimes referred to as persistence or serial correlation, is seen, for example, in the fact that a large stream discharge on a given day will tend to be followed by a large discharge on the next day. The periodicities are due primarily due to seasonal variations in factors such as precipitation and demand for stored water. (Woodard-USGS)  
W78-10640

**LOW-FLOW CHARACTERISTICS OF STREAMS IN THE LOWER WISCONSIN RIVER BASIN,** Geological Survey, Madison, WI. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-10643

**A COMPREHENSIVE METHODOLOGY FOR ASSESSING ENVIRONMENTAL IMPACT,** British Columbia Univ., Vancouver. Dept. of Soil Science.  
For primary bibliographic entry see Field 6G.  
W78-10652

# WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

## Control Of Water On The Surface—Group 4A

**LARGE-SCALE PLANNING PROJECTS: THE TENNESSEE VALLEY AUTHORITY AND THE BRATSK-ILIMSK COMPLEX,**  
International Inst. for Applied Systems Analysis,  
Laxenburg (Austria).  
For primary bibliographic entry see Field 6B.  
W78-10655

**REAL-TIME CONTROL OF WATER QUALITY AND QUANTITY,**  
International Inst. for Applied Systems Analysis,  
Laxenburg (Austria).  
For primary bibliographic entry see Field 5G.  
W78-10657

**AN APPROXIMATE METHOD FOR SIZING DETENTION RESERVOIRS,**  
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.  
S. R. Abt, and N. S. Grigg.  
Water Resources Bulletin, Vol. 14, No. 4, p 956-965, August 1978. 6 fig, 3 tab, 7 ref.

Descriptors: \*Detention reservoirs, \*Water storage, \*Storm water, \*Estimating, \*Sizing, \*Placement, Urban drainage, Management, Runoff, Watersheds(Basins), Hydrographs, Effects, Floods, Equations, Mathematical models, Systems analysis, Comparative analysis.

The detention reservoir is an effective measure for the management of storm water runoff, but random or unplanned placement may aggravate potential flood hazards. An approximate method for the sizing and placement of detention reservoirs is presented. The procedure is based upon the application of a storage estimation equation. The results show that the procedure closely approximates the results produced by the U. S. Army Corps of Engineers HEC-1 Flood Hydrograph Package in computing reservoir capacities on a hypothetical watershed. Pending further tests, the use of the procedure is very limited, but it is an initial step towards incorporating detention storage into regional storm water management plans. (Bell-Cornell)  
W78-10662

**WSP2 COMPUTER PROGRAM. A WATER SURFACE PROFILE COMPUTER PROGRAM FOR DETERMINING FLOOD EVALUATIONS AND FLOOD AREAS FOR CERTAIN LOW RATES. USER'S GUIDE,**  
Soil Conservation Service, Washington, DC. Engineering Div.  
For primary bibliographic entry see Field 7C.  
W78-10669

**AQUATIC HERBICIDES,**  
Nalco Chemical Co., Oak Brook, IL. (Assignee).  
For primary bibliographic entry see Field 5G.  
W78-10722

**SALINITY MANAGEMENT OPTIONS FOR THE COLORADO RIVER, DAMAGE ESTIMATES AND CONTROL PROGRAM IMPACTS,**  
Utah Water Research Lab., Logan.  
For primary bibliographic entry see Field 5G.  
W78-10735

**GUIDELINES FOR EPA REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS ON PROJECTS INVOLVING IMPOUNDMENTS.**  
Curran Associates, Inc., Northampton, MA.  
For primary bibliographic entry see Field 6G.  
W78-10761

**MODEL ORDINANCE FOR STORM DRAINAGE SYSTEMS AND IMPROVEMENTS.**  
Central Midlands Regional Planning Council, Columbia, SC.  
For primary bibliographic entry see Field 6E.

W78-10774

**DETERMINING PRIORITY OF FEDERAL RESERVED RIGHTS,**  
For primary bibliographic entry see Field 6E.  
W78-10777

**DEFERENCE TO STATE COURTS IN THE ADJUDICATION OF RESERVED WATER RIGHTS,**  
Holland and Hart, Denver, CO.  
For primary bibliographic entry see Field 6E.  
W78-10778

**AN ANALYSIS OF THE SCOPE OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT ON THE GARRISON DIVISION UNIT PROJECT: APPLYING A TOTALITY OF CIRCUMSTANCES TEST,**  
For primary bibliographic entry see Field 6G.  
W78-10785

**GOOD TIMES FOR SOIL AND WATER CONSERVATION,**  
Library of Congress, Washington, DC. Congressional Research Service.  
For primary bibliographic entry see Field 6E.  
W78-10791

**PLANNING AND SELECTING SITES FOR WATER STORAGE FACILITIES,**  
For primary bibliographic entry see Field 6E.  
W78-10792

**SPECIFIC PROBLEM ANALYSIS. 1975 NATIONAL ASSESSMENT OF WATER AND RELATED LAND RESOURCES (MISSOURI REGION).**  
Missouri River Basin Commission, Omaha, NE.  
For primary bibliographic entry see Field 6E.  
W78-10798

**REVIEW OF EXISTING STATE LAND USE REGULATION IN FLORIDA--AN OVERVIEW,**  
Florida Law Revision Council, Tallahassee. Office of Statutory Revision.  
For primary bibliographic entry see Field 6E.  
W78-10802

**GONE WITH THE WATER--DRAINAGE RIGHTS AND STORM WATER MANAGEMENT IN PENNSYLVANIA,**  
Pennsylvania Dept. of Environmental Resources, Harrisburg.  
For primary bibliographic entry see Field 6E.  
W78-10807

**PROBLEM IDENTIFICATION, LEGAL ASPECTS OF FLOOD CONTROL, ALTERNATIVE CONTROL MEASURES.**  
Pikes Peak Area Council of Governments, Colorado Springs, CO.  
For primary bibliographic entry see Field 6E.  
W78-10827

**INTERGOVERNMENTAL CONFLICT IN LAND USE PLANNING: THE CALIFORNIA COASTAL ZONE CONSERVATION COMMISSION V. THE LOCAL REDEVELOPMENT AGENCIES,**  
For primary bibliographic entry see Field 6E.  
W78-10833

**FLORIDA'S AREA OF CRITICAL STATE CONCERN: AN UPDATE,**  
Florida Bureau of Land and Water Management, Tallahassee. Div. of State Planning.  
For primary bibliographic entry see Field 6E.  
W78-10835

**EVOLUTION IN THE BRITISH INSTITUTIONAL FRAMEWORK FOR WATER MANAGEMENT,**  
Victoria Univ. (British Columbia). Dept. of Geography.  
For primary bibliographic entry see Field 6E.  
W78-10838

**FEDERAL PARTICIPATION IN SHORE, HURRICANE, AND TIDAL AND LAKE FLOOD PROTECTION.**  
Department of the Army, Washington, DC.  
For primary bibliographic entry see Field 6E.  
W78-10844

**AN EXAMINATION OF THE LAW OF WATER BOUNDARIES AND ACCRETIONS IN MANITOBA,**  
Tallin Knitjansson, Winnipeg (Manitoba).  
For primary bibliographic entry see Field 6E.  
W78-10849

**THE PUBLIC TRUST DOCTRINE AND OWNERSHIP OF FLORIDA'S NAVIGABLE LAKES,**  
For primary bibliographic entry see Field 6E.  
W78-10850

**FLUID ROUTING BY CHARACTERISTIC METHODS,**  
Lanchester Polytechnic, Coventry (England). Dept. of Civil Engineering.  
For primary bibliographic entry see Field 2E.  
W78-10918

**SUBSURFACE DRAINAGE IN SOILS WITH HIGH HYDRAULIC CONDUCTIVITY LAYERS,**  
North Carolina State Univ., at Raleigh. Dept. of Biological and Agricultural Engineering.  
For primary bibliographic entry see Field 2F.  
W78-10922

**LONG-TERM SURFACE-WATER SUPPLY AND STREAMFLOW TRENDS IN THE UPPER COLORADO RIVER BASIN,**  
Arizona Univ., Tucson. Lab. of Tree-Ring Research.  
For primary bibliographic entry see Field 2E.  
W78-10940

**TEMPERATURE ANALYSIS AND SELECTIVE-WITHDRAWAL DESIGN STUDY TALLAHALA CREEK LAKE, MISSISSIPPI; MATHEMATICAL MODEL IN INVESTIGATION,**  
Army Engineer Waterways Experiment Station, Vicksburg, MS.  
For primary bibliographic entry see Field 5B.  
W78-10946

**THE RELIEF AND LAND FORM MAP OF AUSTRALIA: DOES IT SHOW ROCK TYPES AND LAND FORMS OF HYDROLOGIC SIGNIFICANCE,**  
Monash Univ., Clayton (Australia). Dept. of Civil Engineering.  
For primary bibliographic entry see Field 7C.  
W78-10963

**CHEMICAL CHARACTERISTICS OF A DESERT STREAM IN FLASH FLOOD,**  
Arizona State Univ., Tempe. Dept. of Zoology.  
For primary bibliographic entry see Field 2K.  
W78-10964

**WATERWEEDS: FLIES IN THE IRRIGATION OINTMENT,**  
J. Tinker.  
New Scientist, Vol. 61, Mar. 21, 1974, p 747-749, 2 fig.

## Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4A—Control Of Water On The Surface

**Descriptors:** \*Aquatic weed control, \*Biocontrol, \*Aquatic plants, \*Clogging, \*Canals, Ditches, Aquatic algae, Floating plants, Rooted aquatic plants, Submerged plants, Aquatic weeds, Irrigation water.

Aquatic plants are causing serious problems by clogging drainage ditches and irrigation canals throughout Asia and Africa. In reservoirs and Canals water lacks the turbulence of rivers and is consequently clear, allowing light to penetrate and stimulate weed growth. Additionally, the increasing use of fertilizers has added nutrients to these waters and further stimulates growth. There are at least 5 major groups of vegetation that account for much of the problem: (1) water hyacinth, duckweed, water lettuce and water fern all float freely on the surface without rooting, (2) rooted floating plants like the lotus and water lily, (3) rooted weeds whose foliage remains beneath the surface such as wild celery, potamogeton, and Hydrilla verticillata, (4) water weeds that root themselves along the edges with their foliage above water such as bulrush typha and alligator weed, (5) algae. These weeds cause problems not only with clogging but also by encouraging the deposition of silt, robbing water through evapotranspiration, and sometimes creating a new habitat advantageous for samll fish and mosquitoes. Not confined only to Africa and Asia, problems such as these exist the world over and have their own particular characteristics and solutions. A wide range of herbicides are presently being used with consequent worries over their effect on fish and environmental contamination. Some of the capital-poor, labor-rich countries have found success with hand weeding and manual removal, making possible the utilization of some of these weeds for animal feeds, paper and rayon. Some countries are experimenting with biological control with the manatee, the khaki campbell duck, and carp. (Tickes-Arizona). W78-10969

**FEDERAL RECLAMATION AND WATER RIGHTS IN NEVADA,**  
California State Univ., San Diego. Dept. of History.  
For primary bibliographic entry see Field 6E.  
W78-10974

**SYRIA'S EUPHRATES DAM PROMISES RAPID AGRICULTURAL DEVELOPMENT,**  
For primary bibliographic entry see Field 3F.  
W78-10976

**POTENTIALS AND PREDICTIONS CONCERNING RECLAMATION OF SEMIARID MINED LANDS,**  
Montana Agricultural Experiment Station, Bozeman.  
For primary bibliographic entry see Field 5G.  
W78-10985

**SOME APPLICATIONS OF HYDROLOGIC SIMULATION MODELS FOR DESIGN OF SURFACE MINE TOPOGRAPHY,**  
Agricultural Research Service, Fort Collins, CO.  
For primary bibliographic entry see Field 5G.  
W78-10986

**SKYLINE HARVESTING IN APPALACHIA,**  
Northeastern Forest Experiment Station, Broomall, PA.  
For primary bibliographic entry see Field 4C.  
W78-10988

**DRIP/TRICKLE PIPE NETWORK DESIGN,**  
A. G. Water, Shafter, CA.  
For primary bibliographic entry see Field 3F.  
W78-11030

**ON THE ALLOCATION OF PRIME AGRICULTURAL LAND,**  
Harza Engineering Co., Chicago, IL.  
For primary bibliographic entry see Field 3F.  
W78-11031

**MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEM ANALYSIS - APPLICATION TO MEDIUM SIZE COMMUNITIES: URBAN STORM-DRAINAGE SYSTEMS PLANNING,**  
Purdue Univ., Lafayette, IN. Water Resources Research Center.  
For primary bibliographic entry see Field 6A.  
W78-11058

**CALIBRATION AND SENSITIVITY ANALYSIS OF THE CONTINUOUS RUNOFF SIMULATION MODEL 'STORM',**  
Purdue Univ., Lafayette, IN. Water Resources Research Center.  
For primary bibliographic entry see Field 2A.  
W78-11060

**MATHEMATICAL MODELING OF A SOCIOLOGICAL AND HYDROLOGIC DECISION SYSTEM,**  
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.  
For primary bibliographic entry see Field 6A.  
W78-11061

**REASONABLE-BENEFICIAL USE: NEW STATUTORY STANDARD FOR WATER RESOURCES ALLOCATION-INTERPRETATION AND RECOMMENDATIONS,**  
Florida Univ., Gainesville. School of Law.  
For primary bibliographic entry see Field 6E.  
W78-11152

**POLICY AND PROGRAM ANALYSIS OF AN OPEN LAND APPROACH TO FLOOD PLAIN MANAGEMENT,**  
Cornell Univ., Ithaca, NY. Center for Environmental Research.  
For primary bibliographic entry see Field 6F.  
W78-11201

**THE IMPACT OF ENERGY RESOURCE DEVELOPMENT ON WATER RESOURCE ALLOCATIONS,**  
Utah Water Research Lab., Logan.  
For primary bibliographic entry see Field 6B.  
W78-11211

**WATER RESOURCES DATA FOR OREGON, WATER YEAR 1977.**  
Geological Survey, Portland, OR. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11252

**WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1977.**  
Geological Survey, Boston, MA. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11253

**WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1977.**  
Geological Survey, Raleigh, NC. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11254

**STUDY TO DETERMINE DISCHARGE AT 50-PERCENT FLOW DURATION AND ORDINARY HIGH WATER FOR STREAMS IN LOUISIANA,**  
Geological Survey, Baton Rouge, LA. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-11260

**FLOODS OF JUNE 4 AND 12, 1976, AT CULBERTSON, MONTANA,**  
Geological Survey, Helena, MT. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-11262

**CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART A. EARTH SCIENCE IN CLIMATE RESEARCH.**  
Geological Survey, Menlo Park, CA. Geologic Div.  
For primary bibliographic entry see Field 2B.  
W78-11263

**CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART B. CURRENT RESEARCH BY THE GEOLOGICAL SURVEY.**  
Geological Survey, Menlo Park, CA. Geologic Div.  
For primary bibliographic entry see Field 2B.  
W78-11264

**CLIMATE VARIATION AND ITS EFFECTS ON OUR LAND AND WATER, PART C. GEOLOGICAL SURVEY CLIMATE PLAN.**  
Geological Survey, Menlo Park, CA. Geologic Div.  
For primary bibliographic entry see Field 2B.  
W78-11265

**DISCHARGE, GAGE HEIGHT, AND ELEVATION OF 100-YEAR FLOODS IN THE HUDSON RIVER BASIN,**  
Geological Survey, Albany, NY. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-11271

**A SIMPLE-HARMONIC MODEL FOR DEPICTING THE ANNUAL CYCLE OF SEASONAL TEMPERATURES OF STREAMS,**  
Geological Survey, Lakewood, CO. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-11274

### 4B. Groundwater Management

**INTEGRODIFFERENTIAL EQUATIONS FOR SYSTEMS OF LEAKY AQUIFERS AND APPLICATIONS 3. A NUMERICAL METHOD OF UNLIMITED APPLICABILITY,**  
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Investigacion en matematicas Aplicadas Sistemas.  
For primary bibliographic entry see Field 2F.  
W78-10587

**PREDICTING PHOSPHATE MOVEMENT THROUGH SOIL COLUMNS,**  
Connecticut Agricultural Experiment Station, New Haven.  
For primary bibliographic entry see Field 5B.  
W78-10589

**GROUND-WATER RESOURCES OF TANGIPAHOA AND ST. TAMMANY PARISHES, SOUTHEASTERN LOUISIANA,**  
Geological Survey, Baton Rouge, LA. Water Resources Div.



D.J. Nyman, and L. D. Fayard.

Louisiana Department of Transportation, Baton Rouge, Office of Public Works Water Resources Technical Report No 15, 1978. 76 p, 25 fig, 13 plates, 21 tab, 29 ref.

Descriptors: \*Groundwater resources, \*Aquifer characteristics, \*Water wells, \*Water yield, \*Water level fluctuations, Water quality, Hydrogeology, Groundwater movement, Potentiometric level, Water utilization, Drawdown, Groundwater recharge, Water management (Applied), \*Louisiana, St. Tammany Parish, Tangipahoa Parish.

In Tangipahoa and St. Tammany Parishes in southeastern Louisiana north of Lake Pontchartrain there are 12 major aquifers. Wells as deep as 3,354 feet produce freshwater. Water levels range from as much as 80 feet below land surface in shallow aquifers to nearly 100 feet above land surface in deep aquifers. Water levels in aquifers less than 1,000 feet deep are declining less than 1 foot per year; in aquifers deeper than 1,500 feet the average water-level decline is about 2 feet per year. During 1974 an average of 43 million gallons per day was discharged from the aquifers; of this amount, more than 20 million gallons per day was discharged from uncontrolled, or partially controlled, flowing wells. The hardness of water from the aquifers generally is less than 30 mg/liter, the iron and manganese concentration generally is less than 0.5 mg/lite, and dissolved solids generally are less than 350 mg/liter. Water from most of the shallow aquifers and from many of the deep aquifers in the north half of the area tends to be corrosive. (Woodard-USGS)

W78-10620

#### A GROUND-WATER INVENTORY OF THE WAIALUA BASAL-WATER BODY, ISLAND OF OAHU, HAWAII

Geological Survey, Lakewood, CO. Water Resources Div.  
R. H. Dale.

Open-file report 78-24, January 1978. 71 p, 22 fig, 3 tab, 11 ref.

Descriptors: \*Hydrogeology, \*Hydrologic budget, \*Groundwater, \*Aquifer characteristics, \*Saline water-freshwater interfaces, Groundwater availability, Water yield, Groundwater potential, Hawaii, \*Oahu, \*Waialua, \*Groundwater management.

The Waialua basal-water body underlies an area of about 18 square miles on the north shore of the island of Oahu, Hawaii. The basal-water body is a body of fresh ground water that floats on saline ground water in a highly permeable and porous basaltic aquifer. Inflow to the basal-water body is from the deep infiltration of applied irrigation water and from leakage through a low permeability ground-water dam. Outflow from the basal-water body is from basal-water pumpage and leakage through low-permeability boundaries that separate the basal-water body from the ocean. The basal-water flux, computed as either the sum of the inflow terms or the sum of the outflow terms, is about the same value. The basal-water flux is 55 million gallons per day, based on the sum of the outflow terms. The effective porosity was computed at 0.09 by a time-series analysis of basal water in storage is estimated to be  $1.4 \times 10$  to the 11th power gallons. Pumpage from the basal-water body can be increased. The most efficient development method is the skimming shaft. If shafts were used, an additional 15 million gallons per day could be pumped on a sustained basis. (Woodard-USGS)

W78-10622

#### HYDROLOGIC MONITORING OF A DEEPWELL-INJECTION SYSTEM NEAR PEN-

#### SACOLA, FLORIDA, MARCH 1970-MARCH 1977

Geological Survey, Tallahassee, FL. Water Resources Div.  
For primary bibliographic entry see Field 5B.  
W78-10625

#### WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1976

Geological Survey, Raleigh, NC. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10627

#### WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1977

Geological Survey, Towson, MD. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10628

#### WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1977

Geological Survey, Carson City, NE. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10629

#### GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1971-75

Geological Survey, Lawrence, KA. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10630

#### SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--HAWAII REGION

Geological Survey, Honolulu, HI. Water Resources Div.  
K. J. Takasaki.  
Available from Supt. of Documents, GPO, Washington DC, 20402; price \$1.50. Professional Paper 813-M, 1978. 29 p, 15 fig, 3 tab, 103 ref.

Descriptors: \*Groundwater resources, \*Hawaii, \*Hydrology, \*Regional analysis, Evaluation, Water resources development, Islands, Groundwater availability, Potential water supply, Economic feasibility, \*Groundwater appraisal.

The ground-water resources in the Hawaiian Islands offer better prospects for supplying additional water needs in the future than the surface-water resources. Most of the easily developable surface supplies have been fully utilized where needed, and conduits and reservoirs necessary to develop new or additional supplies would generally require large and often prohibitive outlays of capital. In 1975, ground water supplied 46 percent, and surface water 54 percent of the water needs but, in the years ahead, these percentages will likely be reversed as fuller ground-water development takes place. Total water use, in 1975, averaged about 1,775 million gallons per day, of which about 810 million gallons per day was ground water. The water use is divided into public supply, 11 percent; self-supplied industrial use, 23 percent; and agricultural, 66 percent. Groundwater recharge has been estimated at about 6.5 billion gallons per day or roughly 30 percent of the rainfall. Most fresh ground water is stored in the underground space below sea level in porous lava flows, much of it in basal-water lenses floating on heavier saline ground water. (Woodard-USGS)

W78-10635

#### SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--SOURIS-RED-RAINY REGION

Geological Survey, St. Paul, MN. Water Resources Div.  
H. O. Reeder.

Available from Supt. of Documents, GPO, Washington, DC 20402; price, \$1.40. Professional Paper 813-K, 1978. 25 p, 14 fig, 7 tab, 36 ref.

Descriptors: \*Groundwater resources, \*Regional analysis, Water resources development, \*Water management (Applied), Hydrogeology, Aquifer characteristics, Water quality, Groundwater availability, Evaluation, Planning, Montana, North Dakota, South Dakota, Minnesota, \*Souris-Red-Rainy Region (Northcentral U.S.).

A broad-perspective analysis of the ground-water resources and present and possible future water development and management in the Souris-Red-Rainy Region is presented. The region includes the basins of the Souris River within Montana and North Dakota; the Red River of the North in South Dakota, North Dakota, and Minnesota; and the Rainy River within Minnesota. The region includes 59,645 square miles, mostly in North Dakota and Minnesota. This report is one of a U.S. Geological Survey series that summarizes information on the Nation's ground water for the guidance of planners. New data were not collected for this appraisal, but information from many sources has been utilized. In addition to summarizing the knowledge of ground-water resources of the region, the report points out deficiencies in knowledge. The primary objective of evaluating information deficiencies is to direct attention to types of studies and information that will lead to fuller understanding, and description of ground-water reservoirs for better evaluation, planning, and management of the region's water resources. With proper knowledge, utilization, and conjunctive management of all water resources, ground water can assume greater significance in the region's development. (Woodard-USGS)

W78-10636

#### SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--TENNESSEE REGION

Geological Survey, Nashville, TN. Water Resources Div.  
A. Zurawski.  
Available from Supt. of Documents, GPO, Washington DC, 20402; price, \$1.60. Professional Paper 813-L, 1978. 35 p, 23 fig, 4 tab, 61 ref.

Descriptors: \*Groundwater resources, \*Regional analysis, \*Tennessee, \*Aquifers, \*Water quality, Water utilization, Groundwater availability, Hydrogeology, Groundwater recharge, River basins, Water resources development, Planning, Evaluation, \*Tennessee Region.

Ground water is an abundant but underdeveloped resource in the water-rich Tennessee Region. The estimated recharge to aquifers in the region is one-fifth to one-third of the precipitation, or about 8 trillion gallons per year. Less than one percent of this amount of ground water was used in 1970. The aquifers of the Tennessee Region are composed of carbonate rocks, unconsolidated granular material, and fractured noncarbonate rocks. Because of their great areal extent the carbonate aquifers have the greatest potential for ground-water development. Although ground water has been a little used resource in the Tennessee Region, it could play a significant role in regional water supply. However, optimum development would require a degree of knowledge of ground-water occurrence, movement and interaction with surface water that is unavailable in most of the region. Because it is an integral part of the region's water resources, ground water deserves further study and consideration in regional development planning. (Woodard-USGS)

W78-10637

#### SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT LAKES REGION

Geological Survey, Indianapolis, MO. Water Resources Div.

## Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4B—Groundwater Management

W. G. Weist, Jr.

Available from Supt. of Documents, GPO, Washington, DC 20402; price, \$1.50. Professional Paper 813-J, 1978. 30 p, 14 fig, 5 tab, 35 ref.

Descriptors: \*Groundwater resources, \*Great Lakes Region, \*Groundwater availability, \*Water quality, \*Groundwater potential, Groundwater movement, Groundwater recharge, Water wells, Aquifer characteristics, Injection wells.

Ground water available from storage in the Great Lakes Region is estimated to be 35,000 billion cubic feet. Ground-water discharge to stream and lakes in the region is estimated to be 26 billion gallons per day. Despite this abundance of ground water, only 1.8 billion gallons per day was used in the region in 1970. This is about 11.6 percent of the total water used, excluding thermoelectric power use. Ground water is available throughout the Great Lakes Region. However, the amount available locally varies widely. The most productive aquifers, those along the valleys of major streams, yield as much as 5,000 gal/min. Yields in excess of 1,000 gal/min have been obtained from the bedrock in some areas. In addition to being a potential source of water to meet increasing municipal and industrial demands, ground water can be used to augment low streamflow, to dilute water of poorer quality, and to maintain lake levels and wetlands, among other uses. (Woodard-USGS) W78-10638

**NUMERICAL SIMULATION OF STEADY STATE THREE-DIMENSIONAL GROUND-WATER FLOW NEAR LAKES,**  
Geological Survey, Denver, CO. Water Resources Div.  
For primary bibliographic entry see Field 2F.

W78-10642

**HYDROLOGIC RECONNAISSANCE OF THE DUGWAY VALLEY-GOVERNMENT CREEK AREA, WEST-CENTRAL UTAH,**  
Geological Survey, Salt Lake City, UT. Water Resources Div.  
For primary bibliographic entry see Field 7C.

W78-10644

**GROUND-WATER CONDITIONS IN UTAH, SPRING OF 1978,**  
Geological Survey, Salt Lake City, UT. Water Resources Div.  
For primary bibliographic entry see Field 2F.

W78-10645

**PROBABLE YIELDS OF WELLS IN THE SAND-AND-GRAVEL AQUIFER, WISCONSIN,**  
Geological Survey, Madison, WI. Water Resources Div.  
For primary bibliographic entry see Field 7C.

W78-10646

**PROBABLE YIELDS OF WELLS IN THE SAND-STONE AQUIFER, WISCONSIN,**  
Geological Survey, Madison, WI. Water Resources Div.  
For primary bibliographic entry see Field 7C.

W78-10647

**GROUND-WATER POLLUTION BY NITROGEN COMPOUNDS AT OLEAN, NEW YORK--PROGRESS REPORT, JUNE 1977,**  
Geological Survey, Albany, NY. Water Resources Div.  
For primary bibliographic entry see Field 5B.

W78-10649

**A STUDY OF NEAR WELL GROUNDWATER FLOW AND THE IMPLICATIONS IN WELL DESIGN,**  
New South Wales Univ., Kensington (Australia). Water Research Lab.  
For primary bibliographic entry see Field 8B.

W78-10668

**METHOD FOR PRODUCING GEOTHERMAL ENERGY AND MINERALS,**  
Exxon Production Research Co., Houston, TX. (Assignee).  
For primary bibliographic entry see Field 3E.

W78-10715

**CONFLICTS BETWEEN PRIVATE APPROPRIATORS OF STREAM FLOWS AND USERS OF GROUND WATER IN NEBRASKA,**  
For primary bibliographic entry see Field 6E.

W78-10781

**LAND SUBSIDENCE: MENACE TO THE TEXAS GULF COAST,**  
Harris-Galveston Coastal Subsidence District, Houston, TX.  
For primary bibliographic entry see Field 6E.

W78-10782

**DEVELOPMENTS IN GROUNDWATER LAW,**  
Arizona Univ., Tucson. School of Law.  
For primary bibliographic entry see Field 6E.

W78-10794

**WATER WARS OR STREAMS OF PARADISE: DO WE HAVE A CHOICE?**  
For primary bibliographic entry see Field 5G.

W78-10799

**PROPERTY RIGHTS TO GEOTHERMAL RESOURCES (PART ONE),**  
California Univ., Berkeley. School of Law.  
For primary bibliographic entry see Field 6E.

W78-10806

**EVOLUTION IN THE BRITISH INSTITUTIONAL FRAMEWORK FOR WATER MANAGEMENT,**  
Victoria Univ. (British Columbia). Dept. of Geography.  
For primary bibliographic entry see Field 6E.

W78-10838

**SURFACE WATER: TEXAS GULF COAST ALTERNATIVE TO SUBSIDENCE,**  
Harris-Galveston Coastal Subsidence District, Houston, TX.  
For primary bibliographic entry see Field 6E.

W78-10840

**REVIEW OF PROJECTS AFFECTING THE EDWARDS UNDERGROUND RESERVOIR, A DESIGNATED SOLE SOURCE AQUIFER IN THE SAN ANTONIO, TEXAS AREA,**  
Environmental Protection Agency, Washington, DC.  
For primary bibliographic entry see Field 6E.

W78-10856

**NEBRASKA WELL-INTERFERENCE PROBLEMS--A PROPOSAL,**  
For primary bibliographic entry see Field 6E.

W78-10858

**STEADY-STATE DRAWDOWNS IN COUPLED AQUIFERS,**  
Geraghty and Miller, Inc., Tampa, FL.  
For primary bibliographic entry see Field 2F.

W78-10917

**A COMPARISON OF HYDROTHERMAL RESERVOIRS OF THE WESTERN UNITED STATES.**

Geonomics, Inc., Berkeley, CA.  
Available from the National Technical Information Service, Springfield, VA 22161 as EPRI ER-364 1276. Price codes: A08 in paper copy, A01 in microfiche. Topical Report 3, EPRI ER-364, Dec. 1976. 180 p, 33 fig, 9 tab, 193 ref, 3 append.

Descriptors: \*Thermal power, \*Thermal water, \*Geothermal studies, Geology, Petrology, Groundwater, Aquifers, Salinity, Hydrothermal studies, Heat, Powerplants, Thermal powerplants.

This report presented a portion of the results from a one-year feasibility study to assess the feasibility of constructing a 25 to 50 MWe geothermal power plant using low salinity hydrothermal fluids as the energy source. It contained the results of a comparative study of 16 hydrothermal reservoirs in the U.S. The reservoirs were selected for comparison on the basis of available data, development potential, and representativeness of known hydrothermal reservoirs in the U.S. Six reservoir and fluid criteria were considered the most important in determining the development and power conversion potential: depth and lithology, reservoir temperature, tested flow rate per well, fluid chemistry, magnitude of the reserve, and reinjection potential. These criteria were evaluated for each of the selected reservoirs. (Sims-ISWS) W78-10928

**INSTITUTIONAL ARRANGEMENTS FOR EFFECTIVE GROUNDWATER MANAGEMENT TO HALT LAND SUBSIDENCE,**  
Texas A and M Univ., College Station. Dept. of Animal Science.  
W. J. Brah, and L. L. Jones.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 786. Price codes: A09 in paper copy, A01 in microfiche. Texas Water Resources Institute, College Station, Technical Report No. TR-95, May 1978. 194 p, 4 tab, 3 fig, 131 ref. OWRT B-200-TEX(1), 14-34-0001-6122.

Descriptors: \*Land subsidence, \*Management, \*Institutions, Texas, \*Groundwater, \*Subsidence, Conjunctive use, Water utilization, Alternative water use, \*Texas Gulf Coast, \*Houston-Galveston area(Tex).

Alternative political and economic structures for comprehensive management of the complex water problems to halt land subsidence in the Texas Gulf Coastal area of Harris and Galveston counties. Alternative arrangements of legal, economic and political institutions with the capacity and ability to conjunctively manage regional ground and surface water resources to abate and control subsidence are developed and examined. These alternative institutional arrangements are based on both practical and theoretical management methods advanced in the literature on water resource management for solving commonality problems in the use of groundwater resources. W78-11057

**WATER SUPPLIES FOR INDUSTRIAL FIRE PROTECTION,**  
Peerless-Midwest, Inc., Granger, IN.  
R. J. Williams.  
Water Well Journal, Vol 32, No 7, p 55, July, 1978.

Descriptors: \*Water wells, \*Fire protection systems, National Fire Protection Association.

A good fire protection system is required for industries to obtain insurance and comply with state safety codes. Such a system may use as many as three of the nine approved water sources. Water sources which are certain to deliver water to the fire under any circumstance are called primary sources. Secondary sources are acceptable only as

## WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

### Effects On Water Of Man's Non-Water Activities—Group 4C

a back-up for a primary source. Most authorities accept fire wells as primary sources but some underwriters will require two wells, one with an electric pump and one with a diesel pump, to guarantee primary status. Codes require a well to produce 50% over its rated capacity for eight hours. Drillers should be familiar with all NFPA codes before installing a well. A fire well without pumping equipment can be installed for under \$25,000. (Purdin-NWWA)  
W78-11070

**REGIONAL GEOLOGY SERIES: PART VII,**  
National Water Well Association, Worthington, OH.  
For primary bibliographic entry see Field 8B.  
W78-11071

**DRILLING IN THE YEAR 2025,**  
For primary bibliographic entry see Field 8C.  
W78-11072

**PHENOL POISONING DUE TO CONTAMINATED DRINKING WATER,**  
Bureau of Epidemiology, Atlanta, GA. Cancer and Birth Defects Div.  
For primary bibliographic entry see Field 5C.  
W78-11075

**WATER SUPPLY AND CONTROL DEVELOPMENTS SUMMARIZED: ARIZONA.**  
For primary bibliographic entry see Field 3D.  
W78-11076

**ENGINEERING ASPECTS OF GEOTHERMAL DEVELOPMENT WITH EMPHASIS ON THE IMPERIAL VALLEY OF CALIFORNIA,**  
California Inst. of Tech., Pasadena. Environmental Quality Lab.  
M. Goldsmith.  
Energy, Vol 3, p 127-148, April, 1978. 5 fig, 10 tab, 14 ref.

Descriptors: \*Geothermal studies, Civil engineering, \*Economics, \*Thermal power plants, Drilling, Injection, Desalination processes, Distillation, Pipe lines, California, Imperial Valley(Calif).

Engineering considerations involved in the geothermal development plan of the County of Imperial are summarized. Acreage requirements for geothermal drilling and electric generating stations are discussed. Drilling costs vary roughly as the square of the depth beyond 5000 feet. Cost optimization requires a balance between drill cost, set-up cost, transmission pipe cost, land fees, etc. Offshore drilling and construction of a power plant over the Salton Sea are considered. In this case, environmental impact is more important and affects the cost. Problems associated with the reinjection and transmission of geothermal fluids are presented. A section on power plants attempts to give scaling relationships for land area, cost and performance, according to size and reservoir temperature. The problem of cooling power plants is important, particularly in an arid agricultural area. Cooling requirements, water availability and water suitability are discussed. The feasibility of desalting geothermal brine by distillation is considered. The simplest distillation process is to condense and capture the exhaust steam. However unless major reductions in capital cost are realized, geothermal brine desalting in the Imperial Valley will not be economical. (Purdin-NWWA)  
W78-11078

**REASONABLE-BENEFICIAL USE: NEW STATUTORY STANDARD FOR WATER RESOURCES ALLOCATION-INTERPRETATION AND RECOMMENDATIONS,**  
Florida Univ., Gainesville. School of Law.  
For primary bibliographic entry see Field 6E.  
W78-11152

**LOS ANGELES V. SAN FERNANDO: GROUND WATER MANAGEMENT IN THE GRAND TRADITION,**  
Southern California Metropolitan Water District of Los Angeles.  
For primary bibliographic entry see Field 6E.  
W78-11165

**GROUNDWATER MANAGEMENT IN NEBRASKA WITHOUT A LEGISLATIVE SOLUTION: IS THERE AN ALTERNATIVE,**  
For primary bibliographic entry see Field 6E.  
W78-11168

**INSTITUTIONAL ALTERNATIVES FOR MANAGING GROUNDWATER RESOURCES: NOTES FOR A PROPOSAL,**  
Arizona Univ., Tucson. School of Law.  
For primary bibliographic entry see Field 6E.  
W78-11170

**ARTESIAN WELLS.**  
For primary bibliographic entry see Field 6E.  
W78-11180

**WATER RESOURCES DATA FOR OREGON, WATER YEAR 1977.**  
Geological Survey, Portland, OR. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11252

**WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1977.**  
Geological Survey, Boston, MA. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11253

**WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1977.**  
Geological Survey, Raleigh, NC. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11254

**AQUIFER TESTS - THE STATE OF THE ART IN HYDROLOGY,**  
Geological Survey, Lubbock TX. Water Resources Div.  
For primary bibliographic entry see Field 2F.  
W78-11257

**STRATIGRAPHIC TEST WELL, NANTUCKET ISLAND, MASSACHUSETTS,**  
Geological Survey, Reston, VA. Geologic Div.  
D. W. Folger, J. C. Hathaway, R. A. Christopher, P. C. Valentine, and C. W. Poag.  
Available from the Branch of Distribution, USGS, 1200 S. Eads St., Arlington, VA 22202. Circular 773, 1978. 28 p, 11 fig, 2 tab, 47 ref.

Descriptors: \*Test wells, \*Stratigraphy, \*Groundwater, \*Water quality, Freshwater, Brackish water, Depth, Sediments, Aquifers, Islands, Atlantic Ocean, Massachusetts, \*Nantucket Island.

The U.S. Geological Survey, in cooperation with the Massachusetts Water Resources Commission and the Nantucket Conservation Foundation, continuously cored 514 m of sediment and volcanic rock in a stratigraphic and water-quality test near the geographic center of Nantucket Island. Stratified sediments were divided texturally into three zones: the upper zone (0-128 m) contains mostly coarse sand and gravel; the middle zone (128-349 m) contains mostly silty clay and a few beds of sand and silt; and the lower zone (349-457

m) contains soft, unconsolidated, clayey sand. Below the lower zone, a saprolite, composed mostly of clay, grades abruptly downward at 470 m into partially altered basalt that extends to the bottom of the hole at 514 m. Calculations based on the Ghyben-Herzberg principle predicted a zone of freshwater 120-150 m thick. This principle is the theory of hydrostatic equilibrium between freshwater and more dense seawater in a coastal aquifer; it states that for each meter of groundwater elevation above sea level, the freshwater lens will depress the saltwater interface about 40 m below sea level. Freshwater or low-salinity brackish water was found in sediments far below the depth predicted by the Ghyben-Herzberg principle. These interstitial waters are probably relict ground water emplaced during times of low sea level during the Pleistocene. (Woodard-USGS)  
W78-11266

**WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, SEPTEMBER 1977.**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11270

**WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1974-78,**  
Geological Survey, Lakewood, CO. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11273

**JANUARY 1978 WATER LEVELS, AND DATA RELATED TO WATER-LEVEL CHANGES SINCE 1940 OR 1950, WESTERN KANSAS,**  
Geological Survey, Garden City, KS. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11275

**GROUNDWATER DATA FOR THE SALT BASIN, EAGLE FLAT, RED LIGHT DRAW, GREEN RIVER VALLEY, AND PRESIDIO BOLSON IN WESTERNMOST TEXAS,**  
Geological Survey, Austin, TX. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11276

#### 4C. Effects On Water Of Man's Non-Water Activities

**INFLUENCE OF VEGETATION ON WATER REPELLENCY IN SELECTED WESTERN WISCONSIN SOILS,**  
North Dakota State Univ., Fargo.  
For primary bibliographic entry see Field 2G.  
W78-10520

**IMPLICATIONS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT,**  
Pennsylvania State Univ., University Park. Dept. of Forestry.  
J. A. Lynch, E. S. Corbett, and R. Hoopes.  
Fisheries, Vol. 2(2), 1977, p 16-22. 50 ref.

Descriptors: \*Streams, \*Water quality, Fresh water fish, Trout, \*Water temperature, \*Sediments, Nutrients, Organic matter, Food webs, Food habits, Streamflow, \*Timber harvest, \*Logging, \*Clearcutting, Allochthonous organic detritus.



## Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4C—Effects On Water Of Man's Non-Water Activities

Forestry management practices affect small headwater streams adversely. Clear, cutting, timber harvesting can be damaging. Other parameters affected are water temperature, turbidity and sedimentation, dissolved nutrients, allochthonous organic detritus and streamflow. (EIS-Katz)  
W78-10565

**EFFECTS OF URBAN DEVELOPMENT ON THE FLOOD-FLOW CHARACTERISTICS OF THE WALNUT CREEK BASIN, DES MOINES METROPOLITAN AREA, IOWA.**  
Geological Survey, Iowa City, IA. Water Resources Div.  
O. G. Lara.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 093, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-11, February 1978. 31 p, 9 fig, 1 tab, 14 ref.

Descriptors: \*Urban runoff, \*Urban hydrology, \*Urbanization, \*Model studies, \*Rainfall-runoff relationships, Baseline studies, Flood flow, Flood frequency, Analytical techniques, Hydrograph analysis, Gaging stations, \*Iowa, \*Des Moines metropolitan area(Iowa).

Model studies were made to determine the probable impact of urban development on the magnitude and frequency of flooding in the lower reach of the Walnut Creek basin, Des Moines metropolitan area, Iowa. Stream-modeling techniques, which include complete definition of unit hydrographs and precipitation loss-rate criteria, were utilized to evaluate the effects of urban development as measured by percentages of impervious area over the basin. A mathematical model, called HEC-1, was calibrated by using concurrent rainfall-runoff data collected at three gaging stations in the basin. The model parameters were regionalized to allow future users to estimate the model parameters for ungaged areas within the basin. Long-term rainfall data recorded at two nearby stations were employed as basic input to the calibrated model to generate annual peak discharges corresponding to selected degrees of urbanization. Results are presented in tables and graphs, which compare the preurban and urban floodflow characteristics of the lower reach of the Walnut Creek basin. (Woodard-USGS)  
W78-10633

**THE IMPACT OF HUMAN TRAMPLING ON PHOSPHORUS LOADING TO A SMALL LAKE IN GATINEAU PARK, QUEBEC, CANADA.**  
Brock Univ., St. Catharines (Ontario). Dept of Biological Sciences.  
For primary bibliographic entry see Field 5C.  
W78-10653

**WATER WARS OR STREAMS OF PARADISE: DO WE HAVE A CHOICE.**  
For primary bibliographic entry see Field 5G.  
W78-10799

**THE IMPACT OF WATER RIGHTS AND LEGAL INSTITUTIONS ON LAND AND WATER USE IN 2000.**  
Iowa State Univ., Ames. Center for Agricultural and Rural Development.  
For primary bibliographic entry see Field 6D.  
W78-10803

**LOCALLY HEAVY SNOW DOWNWIND FROM COOLING TOWERS.**  
National Weather Service Forecasting Office, Charleston, WV.  
R. E. Otts.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-263 390, Price codes: A02 in paper copy, A01 in microfiche. Technical Memorandum NWS ER-62, December 1976. 9 p, 4 fig, 3 ref.

Descriptors: \*Snowfall, \*Cooling towers, \*Powerplants, \*West Virginia, Weather, Weather forecasting, Snow, Precipitation(Atmospheric), Moisture, Heat, Nuclear powerplants, Effects, Winds, Meteorology, Cooling towers effects.

Previous studies have speculated about the environmental impact of cooling towers at power plants. Of particular concern has been the extent to which heat and moisture pollution may influence the behavior of the atmosphere. Two locally heavy snowfalls were observed near Charleston, West Virginia, in synoptic situations which experienced forecasters normally associate with light snowfall or snow flurry activity. In both cases, the heaviest snowfall occurred downwind from the John E. Amos Power Plant (2900 MWe), a complex that includes three of the largest cooling towers in the United States. The power plant is located about 15 miles west northwest of Kanawha County Airport, the location of the National Weather Service observation site. Conditions favoring the development of locally heavy snows downwind from cooling towers appear to be as follows: (1) a strong influx of cold air into the area, (2) high relative humidity and an unstable lapse rate in the lower layers of the atmosphere, (3) a strong inversion layer near 5,000 feet (1,500 m), topping the unstable lower layer, (4) cyclonic curvature of the flow pattern, (5) an average temperature of minus 10C or colder in the lower layer (from the ground to the bottom of the inversion), and (6) some initial orographic lifting or some other type of forced ascent to the airflow. Strongest effects occur downwind from the source near the axis of the mean wind in the 1,000 - 4,000 foot layer. (Sims-ISWS)  
W78-10942

**SOIL EROSION AND ITS CONTROL IN EASTERN WOODLANDS.**  
Northeastern Forest Experiment Station, Broomall, PA.  
For primary bibliographic entry see Field 2J.  
W78-10987

**SKYLINE HARVESTING IN APPALACHIA.**  
Northeastern Forest Experiment Station, Broomall, PA.  
J. N. Kochenderfer, and G. W. Wendel.  
Research paper NE-400, 1978. 9 p, 4 fig, 7 ref.

Descriptors: Partial cutting, Hardwoods logging, Forest roads, Land management, \*Skyline harvesting, Forest management, \*Appalachian mountains regions.

The URUS, a small standing skyline system, was tested in the Appalachian Mountains of north-central West Virginia. Some problems encountered with this small, mobile system are discussed. From the results of this test and observation of skyline systems used in the western United States, the authors suggest some machine characteristics that would be desirable for use in the Appalachians. (Forest Service)  
W78-10988

**SOIL EROSION IN THE EASTERN FOREST.**  
Northeastern Forest Experiment Station, Broomall, PA.  
J. H. Patric.  
Journal of Forestry, Vol 74, No 10, October, 1976, 5 fig, 3 tab, 64 ref.

Descriptors: Forests, \*Erosion, Timber harvest, Logging roads, Stream channels, \*Lumbering, \*Soil erosion, \*Eastern United States(Forests).

An overview is presented of what is known about forest soil erosion in eastern United States. By most accounts, erosion from undisturbed as well as carefully managed forest land is 0.05 to 0.10 ton/acre/year; that is less than the geologic norm (0.18 to 0.30) and far less than maximum tolerable

rates for agricultural land (1 to 5 tons/acre/year). Eroded material is about equal parts of particulate and dissolved matter. Responsibly managed timber harvest causes only minor increases in forest soil erosion, usually from channels and logging roads, but irresponsible timber harvest can increase erosion of particulate matter to unacceptable levels. (Forest Service)  
W78-10990

**AREA IN SKIDROADS, TRUCK ROADS, AND LANDINGS IN THE CENTRAL APPALACHIANS.**  
Northeastern Forest Experiment Station, Broomall, PA.  
J. N. Kochenderfer.  
Journal of Forestry, Vol 75, No 8, p 507-508, August 1977. 3 fig, 6 ref.

Descriptors: \*Logging roads, Road density, Soil disturbance, Lumbering, Road construction, \*Appalachian mountain region, Wheeled skidders, Jammers.

In nine central Appalachian areas logged with wheeled skidders, there was 1 mile of road for every 19.8 acres; roads and landings occupied 10.3 percent of the area. In two areas logged with jammers, there was 1 mile of road for every 31.1 acres; roads and landings occupied 7.8 percent of the area. (Forest Service)  
W78-10993

**MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND.**  
Colorado State Univ., Fort Collins. Dept. of Earth Sciences.  
D. O. Doehring, and M. E. Smith.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 708, Price codes: A06 in paper copy, A01 in microfiche. Colorado Environmental Resources Center, Fort Collins, Completion Report No. 83, January 1978. 95 p, 38 fig, 4 tab, 30 ref, 3 append. OWRB-147-COLO(1), 14-34-0001-6136.

Descriptors: Runoff, \*Floodplains, \*Urbanization, Floodplain hydrology, \*Urban watersheds, Hydrology, \*Flood hazards, \*Model studies, \*New England, Flood control.

Flood hazard delineation in the United States has been usually based on the assumption that one percent annual flood expectancy is static, and that subsequent urbanization of the catchment will have no significant impact on that expectancy. Research during the past three years demonstrates that this assumption is incorrect in certain settings where the hydrologic response of a watershed to extensive urban growth is conditioned by geologic, pedologic and morphometric parameters. These relationships have been synthesized into an algorithm which predicts the change in discharge corresponding to indices of urban land use changes, surficial properties of the catchment, and the configuration of the network of drainage. Flood expectancies were calculated by standard statistical analyses of annual maxima. The final algorithm was developed by a stepwise multiple regression technique and utilized data from 18 watersheds in southeastern New England. Similar evaluations of monthly maxima of average daily discharge produced comparable results and indicate an absence of seasonal or climatic control over observed hydrologic change accompanying urbanization.  
W78-11064

**WATER PROBLEMS IN THE RURAL ENVIRONMENT-ALTERNATIVE SOLUTIONS FOR WATER SUPPLY AND WASTEWATER DISPOSAL.**  
For primary bibliographic entry see Field 3F.  
W78-11244

**URBAN STORMWATER RUNOFF DATA FOR A RESIDENTIAL AREA, POMPANO BEACH, FLORIDA.**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11258

**FLOOD INVESTIGATIONS IN NEVADA THROUGH 1977 WATER YEAR, PROGRESS REPORT 17.**  
Geological Survey, Carson City, NV. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-11269

**SUPPLEMENTARY HYDRAULIC ANALYSIS OF PROPOSED BRIDGE SITE ON MOHAWK RIVER, WHITESBORO, NEW YORK.**  
Geological Survey, Albany, NY. Water Resources Div.  
R. Lumia.  
Open-file report 78-348, April 1978. 4 p, 1 fig, 1 tab, 3 ref.

Descriptors: \*Bridge design, \*Flood discharge, \*Design flood, \*Peak discharge, \*New York, Road design, Overflow, Hydraulics, \*Mohawk River, \*Whitesboro(NY).

As a supplement to a 1975 report, titled 'Floodflow Characteristics at Proposed Bridge Site on Mohawk River, Whitesboro, New York,' by Bernard Dunn (U.S. Geological Survey open-file report), in which the hydraulic effects of two alternative highway plans during a large-magnitude flood were evaluated, a hydraulic analysis was made for a third highway plan. The two plans evaluated in the original report were found to be infeasible by the State Department of Transportation. A design-flood discharge of 18,200 cubic feet per second was used in the new evaluation, as in the original report. The recurrence interval of that flood is approximately 100 years. The corresponding peak flood stage at the proposed bridge site was determined by the New York State Department of Transportation to be 411.8 feet. During the design flood, the new proposed alternative would cause a 0.1-foot increase in water-surface elevation from the bridge to the approach section; 1,300 cubic feet per second would overflow the road north of the bridge and 6,800 cubic feet per second south of it. Discharge through the bridge would be 10,100 cubic feet per second. (Woodard-USGS)  
W78-11272

#### 4D. Watershed Protection

**IRRIGATION WATER SALT CONCENTRATION INFLUENCES ON SEDIMENT REMOVAL BY PONDS.**  
Agricultural Research Service, Kimberly, ID. Snake River Conservation Research Center.  
For primary bibliographic entry see Field 5G.  
W78-10521

**EFFECT OF MULCHING ON SEDIMENT IN RUNOFF FROM SIMULATED RAINFALL.**  
California Univ., Davis. Dept. of Land, Air, and Water Resources.  
M. J. Singer, and J. Blackard.  
Soil Science Society of America Journal, Vol 42, No 3, p 481-486, May-June 1978. 2 fig, 2 tab, 22 ref.

Descriptors: \*Erosion control, \*Mulching, \*Simulated rainfall, Laboratory tests, Erosion, Soil erosion, Litter, Leaves, Runoff, Infiltration, Data processing, Sediments, Sediment control, Effects, Redwood litter, Oakleaf mulch, Oat straw mulch.

Simulated rainfall was used to test the relationship between sediment in runoff and percent of the soil that was mulch covered. Oak leaves, redwood litter, and oat straw were used as mulches on a 0.37 sq m plot of Auburn (loamy, mixed, thermic, Ruptic-Lithic Xerochrepts) surface soil at a 9% slope. Cover percentage was related to sediment in surface runoff by a parabolic relationship. The relationship between redwood and oak covers and sediment in runoff was not significantly different, but both were significantly different from oat straw. Cover shape or distribution of inter-cover space appears to be important in affecting sediment loss. Runoff volume was reduced significantly by high cover levels which protected the soil from sealing and helped maintain a high infiltration rate. (Sims-ISWS)  
W78-10522

**RAINFALL-RUNOFF DATA FOR SELECTED BASINS, PORTLAND, OREGON, AND VANCOUVER, WASHINGTON, 1973-77.**  
Geological Survey, Portland, OR. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10631

**EFFECTS OF URBAN DEVELOPMENT ON THE FLOOD-FLOW CHARACTERISTICS OF THE WALNUT CREEK BASIN, DES MOINES METROPOLITAN AREA, IOWA.**  
Geological Survey, Iowa City, IA. Water Resources Div.  
For primary bibliographic entry see Field 4C.  
W78-10633

**ECONOMICS OF MULTIPLE-USE FORESTRY.**  
Victoria Univ. (British Columbia).  
For primary bibliographic entry see Field 6B.  
W78-10654

**WATER QUALITY OF NORMAL AND STORM-INDUCED SURFACE WATER RUNOFF: KANE'OHE BAY WATERSHED OAHU, HAWAII FEBRUARY 1974 TO MARCH 1975.**  
Hawaii Univ., Honolulu.  
For primary bibliographic entry see Field 5C.  
W78-10665

**REGULATORY PROGRAMS FOR NONPOINT POLLUTION CONTROL: THE ROLE OF CONSERVATION DISTRICTS.**  
National Association of Conservation Districts, Washington, DC.  
For primary bibliographic entry see Field 5G.  
W78-10797

**SOIL EROSION IN THE EASTERN FOREST.**  
Northeastern Forest Experiment Station, Broomall, PA.  
For primary bibliographic entry see Field 4C.  
W78-10990

**NITROGEN AND PHOSPHORUS MOVEMENT FROM AGRICULTURAL WATERSHEDS.**  
Agricultural Research Service, Columbia, CO.  
For primary bibliographic entry see Field 5B.  
W78-11040

**MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND.**  
Colorado State Univ., Fort Collins. Dept. of Earth Sciences.  
For primary bibliographic entry see Field 4C.  
W78-11064

**EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS SYMPOSIUM.**  
International Association of Hydrological Sciences, Paris (France).  
For primary bibliographic entry see Field 2J.  
W78-11113

**METHODS FOR COMPUTATION OF RUNOFF AND SEDIMENT YIELD FROM SLOPES USED FOR AGRICULTURAL NEEDS.**  
Gosudarstvennyi Gidrologicheskii Inst., Leningrad (USSR).  
For primary bibliographic entry see Field 2J.  
W78-11119

**THE EFFECT OF EXOGENOUS AND ENDOGENOUS FACTORS ON WATER EROSION DEVELOPMENT IN THE USSR.**  
Gosudarstvennyi Gidrologicheskii Inst., Moscow (USSR).  
For primary bibliographic entry see Field 2J.  
W78-11120

**SEDIMENT YIELD IN RELATION TO DRAINAGE BASIN CHARACTERISTICS IN SOME INDIAN RIVER VALLEY PROJECTS.**  
Council of Scientific and Industrial Research, New Delhi (India).  
For primary bibliographic entry see Field 2J.  
W78-11123

**THE EFFECT OF FARMING UPON SOLID TRANSPORT IN THE RIVER ALMOND, SCOTLAND.**  
Baghdad Univ. (Iraq). Dept. of Geology.  
For primary bibliographic entry see Field 2J.  
W78-11126

**SUSPENDED LOAD IN CAMEROUN (TRANSPORTS SOLIDES EN SUSPENSION AU CAMEROUN).**  
Office de la Recherche Scientifique et Technique Outre-Mer, N'Djamena (Chad). Centre (ORSTOM) de Yaounde.  
For primary bibliographic entry see Field 2J.  
W78-11128

**TRANSPORT OF BED LOAD AND SUSPENDED LOAD BY RIVERS FROM LOW RAINFALL AREAS IN AFRICA.**  
British Columbia Univ., Vancouver.  
For primary bibliographic entry see Field 2J.  
W78-11129

**SEDIMENT TRANSPORT IN THE HOPE RIVER, JAMAICA: A TROPICAL DRAINAGE BASIN CHARACTERIZED BY SEASONAL FLOW.**  
University of the West Indies Kingston (Jamaica). Dept. of Geology.  
For primary bibliographic entry see Field 2J.  
W78-11130

**SEDIMENT DELIVERY RATIOS DETERMINED WITH SEDIMENT AND RUNOFF MODELS.**  
Agricultural Research Service, Temple, TX. Grassland Forage Research Center.  
For primary bibliographic entry see Field 2J.  
W78-11132

**A SEDIMENT YIELD INDEX AS A CRITERION FOR CHOOSING PRIORITY BASINS.**  
All Indian Soil and Land Use Survey, New Delhi.  
For primary bibliographic entry see Field 2J.  
W78-11133

## Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

### Group 4D—Watershed Protection

**BASIN SEDIMENT YIELD MODELLING USING HYDROLOGICAL VARIABLES**, Queens Univ., Kingston (Ontario). Dept. of Geography.  
For primary bibliographic entry see Field 2J.  
W78-11134

**PIPING IN THE MILK RIVER CANYON, SOUTHEASTERN ALBERTA—A CONTEMPORARY DRYLAND GEOMORPHIC PROCESS**, Queens Univ., Kingston (Ontario). Dept. of Geography.  
For primary bibliographic entry see Field 2J.  
W78-11138

**STREAM DISCHARGE, SUSPENDED SEDIMENT AND EROSION RATES IN THE RED DEER RIVER BASIN, ALBERTA, CANADA**, Alberta Univ., Edmonton. Dept. of Geography.  
For primary bibliographic entry see Field 2J.  
W78-11139

**EROSION MODALITIES IN THE LOWER BASIN OF THE OUED ELHADJEL (CENTRAL TUNISIA) (CAUSES ET MODALITIES DE L'EROSION DANS LE BASSIN VERSANT INFÉRIEUR DE L'OUED EL-HADJEL (TUNISIE CENTRALE))**, Office del Recherche Scientifique et Technique Outre-Mer, Tunis (Tunisia).  
For primary bibliographic entry see Field 2J.  
W78-11140

**A STUDY OF SOLID TRANSPORT DURING A TRADITIONAL MANAGEMENT PROGRAMME USING SURFACE RUNOFF TO NOURISH OLIVE PLANTATIONS IN THE SAHEL REGION OF TUNISIA (CONTRIBUTION A L'ETUDE DES TRANSPORTS SOLIDES DANS UN AMENAGEMENT TRADITIONNEL D'UTILISATION DES EAUX DE RUISSELLEMENT POUR L'ALIMENTATION DES PLANTATIONS D'OLIVIERES DANS LA REGION DU SAHEL DE TUNISIE)**, Centre de Recherche de Genie Rural, Tunis (Tunisia).  
For primary bibliographic entry see Field 2J.  
W78-11143

**THE EFFECTS OF HYDRAULIC CONSTRUCTIONS ON SOLID TRANSPORT IN NORTH AFRICA (EFFETS SUR LES TRANSPORTS SOLIDES DES OUVRAGES HYDRAULIQUES EN AFRIQUE DU NORD)**, Office de la Recherche Scientifique et Technique Outre-Mer, Tunis (Tunisia).  
For primary bibliographic entry see Field 2J.  
W78-11144

**SEDIMENTOLOGICAL ASPECTS OF WITHDRAWING WATER FROM RIVERS**, Waterloorkundig Lab., Delft (Netherlands). G. J. Klaassen, and M. de Vries.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 301-313, July 1977. 8 fig, 1 tab, 16 ref.

Descriptors: \*Model studies, \*Diversion structures, \*Erosion control, \*Rivers, \*Sediment control, Mathematical models, Analytical techniques, Analysis, Deposition (Sediments), Sediment transport, Intakes, Trapping, Trap efficiency, Foreign countries, Foreign research, Sedimentology, Sediments, River beds, Running waters, Equations, Withdrawal.

Withdrawing water from rivers, notably for irrigation, may cause a number of sedimentological problems. The problems can be categorized in three groups: (1) How is the river bed reacting to

any artificial change of water discharge. (2) How can the entry of sediment into the conveyance system be reduced as much as possible. (3) How can the sediment, still withdrawn together with the water, be trapped downstream of the intake structure. The use of mathematical models to obtain insight into the various phenomena was advocated. As an example, the morphological changes to be expected due to the withdrawal of water from the Tana River in Kenya were determined. Furthermore, sedimentation in a sand trap downstream of an intake structure was simulated using a mathematical model. The validity of the method outlined has not yet been tested extensively by experiments either in the field or in a laboratory. (See also W78-11113) (Humphreys-ISWS)  
W78-11145

**PROBLEMS OF SEDIMENT CONTROL AT AN INTAKE STRUCTURE ON THE HABLE-RUD RIVER AND ITS INFLUENCE ON THE SEDIMENT REGIME OF THE RIVER**, Water Resources Research Inst., Tehran (Iran). F. Parhami.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 314-324, July 1977. 8 fig, 1 tab.

Descriptors: \*Sediment control, \*Model studies, \*Diversion structures, \*Hydraulic models, Laboratory tests, Sediment transport, Intakes, Foreign countries, Foreign research, Rivers, Canals, Bed load, Distribution patterns, Flow, Erosion, Sediment distribution, Suspended load, Sediment discharge, \*Iran, \*Hable-Rud River (Iran), Movable bed model.

The paper described model investigation of a canal intake structure carried out at the Hydraulic Laboratory of the Ministry of Energy, Iran. The investigations have led to an improvement in design as regards sediment control. The paper also presented a study and an analysis of the sediment carried by the Hable-Rud River, both in suspension and as bed load, and its variation throughout the year. The concentration of sediment ranged from 0.1 to 200 kg/cu m during flood periods. The characteristics of the river which lead to these conditions were discussed. The problem of sediment elimination at the diversion headworks of a canal is particularly difficult; and, in this case, a considerable reduction was achieved by careful design of the entrance to the intake, which resulted in favorable conditions for the control of movement of bed load sediment. The paper included several photographs and maps to illustrate the distribution of bed material near the intake structure for different flow conditions and showed the profile of the river bed upstream and downstream of the diversion dam. The model study proved to be a useful means of assessing the hydraulic performance of the intake structure and of improving the preliminary designs. The details of the particle size analyses indicated that the materials used in the tests were close to the required grading curve. The final intake structure design prevents bed load entering the canal at various discharges with different sediment concentrations and also facilitates the flushing of the bed load material deposited in front of the intake. (See also W78-11113) (Humphreys-ISWS)  
W78-11146

**SEDIMENT PROBLEMS AT INTAKES FOR HYDROPOWER PLANTS**, Uttar Pradesh Irrigation Research Inst., Roorkee (India).  
For primary bibliographic entry see Field 8B.  
W78-11148

**A NEW TYPE OF INTAKE STRUCTURE SUITABLE FOR ARID CONDITIONS**, Technische Univ., Darmstadt (West Germany). Inst. fuer Wasserbau und Wasserwirtschaft.

W. Schroder, and P. Sulser.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 338-343, July 1977. 4 fig, 2 ref.

Descriptors: \*Intakes, \*Model studies, \*Diversion structures, \*Sediment control, Bypasses, River training, Hydraulic models, Arid climates, Rivers, Running waters, Movable dams, Foreign research, Foreign countries, Sediment transport, \*Tunisia, Inflatable dams.

A completely new type of intake structure was developed by hydraulic model investigation for taking 5 cu m/s irrigation water from the Medjerda near Bou Salem, Tunisia, (median discharge about 22 cu m/s). It is suitable for rivers in arid or semiarid regions, characterized by great discharge differences and high sediment loads. It works in the following way: (1) A short and low inflatable dam maintains a proper water level. When the dam is deflated, the stream flow may wash away the sediment which has settled on the bottom of the river near the intake. (2) A training wall of smooth curvature connects the dam with the opposite bank. Its crest is a little higher than that of the inflated dam. (3) There is a low section in the training wall causing the flow upstream to be divided. The sediment laden bottom flow mainly passes through this gap and does not reach the intake. Moreover, the gap creates a spiral motion in the stream branch passing the intake, reducing further the sediment content of intake water. (4) The intake is arranged at an acute angle to the flow direction to prevent eddy formation at the entrance. (5) A special bank form upstream of the intake guarantees a smooth flow-adapted boundary. (6) Rip rap of different stone weights is needed to protect parts of the river bottom and parts of the banks against flood flow attacks. A scour hole in the river bottom downstream of the structure is inevitable. It must be kept well downstream of the structure and off the banks, mainly by a suitable trace of the upper part of the training wall. (See also W78-11113) (Humphreys-ISWS)  
W78-11149

**SEDIMENT PROBLEMS RELATED TO INCREASED DISCHARGES AT THE INTAKE OF A RUN-OF-RIVER CANAL SYSTEM IN HARYANA (INDIA)**, Office of the Chief Engineer, Chandigarh (India). Irrigation Works.  
D. D. Taneja.  
In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 344-352, July 1977. 1 fig, 5 tab, 5 ref.

Descriptors: \*Intakes, \*Diversion structures, \*Sediment control, \*Alluvial channels, Canals, Rivers, Irrigation canals, Desilting, Bypasses, Data collections, Foreign countries, Foreign research, Sediment discharge, Running waters, \*India, Sediment concentration.

The original wide and shallow weirs located in a boulder lined river beach, with intake regulators located at different positions and at different levels, do not provide effective stilling pond conditions for feeding the canals; consequently, only a limited sediment-free discharge can be withdrawn into the canals. With increasing intake discharge on the Western Yamuna Canal in Haryana (India), the intensity of sediment ingress increases markedly in the rainy months when the river carries a high sediment load. Solution of the problem seems possible by using an existing crossing of the canal by a hill torrent, as a sediment trapping and flushing device, without wastage of canal supplies. This simple and inexpensive method can be used profitably on canals in similar situations in India and other countries. The sediment regime of a river is affected by the construction of weirs and



barrages. Initially, the slopes upstream are reduced and the levels downstream are lowered due to retrogression as a consequence of reduction of discharge and sediment load. With time, however, due to the occurrence of floods, the original regime is recovered except for a change in the size range and roughness of material downstream. Model experiments are being conducted now to provide suggestions for the construction of suitable spreaders or diffusers, to be located at the inlet of the canal at the channel crossing, and to enable the incoming discharge to spread uniformly over the entire width of the pond. (See also W78-11113) (Humphreys-ISWS)  
W78-11150

**INORGANIC PHOSPHORUS SPECIES AND TRANSFER MECHANISMS IN SOILS TO SEDIMENTS FOR TWO SMALL KANSAS WATERSHEDS.**  
Kansas Water Resources Research Inst., Manhattan.

For primary bibliographic entry see Field 5B.  
W78-11206

## 5. WATER QUALITY MANAGEMENT AND PROTECTION

### 5A. Identification Of Pollutants

**SENSITIVITY ANALYSIS OF GENERALIZED STREETER-PHELPS MODELS.**  
Consiglio Nazionale delle Ricerche, Milan (Italy). Centro Teoria dei Sistemi.  
For primary bibliographic entry see Field 5B.  
W78-10516

**APPARATUS FOR THE CONTINUOUS DISSOLUTION OF POORLY WATER-SOLUBLE COMPOUNDS FOR BIOASSAYS.**  
California Univ., Berkeley. Sanitary Engineering Research Lab.  
S. Krugel, D. Jenkins, and S. A. Klein.  
Water Research, Vol. 12, p 269-272, 1978. 3 fig, 1 tab.

Descriptors: \*Bioassay, \*Equipment, Analytical techniques, Laboratory tests, Fuels, Solubility, Aqueous solutions, Toxicity, Water quality, Water analysis, Gas chromatography, Methodology, Laboratory equipment.

An apparatus was designed and constructed to supply a continuous flow of water, saturated with soluble components of JP8 jet fuel. The product water, used to supply continuous flow bioassays, was found to be comparable in quality to that obtained with static dissolution techniques. The apparatus is constructed of inert materials and operates without pumps or other electro-mechanical regulating devices. (EIS-Deal)  
W78-10541

**SOME OBSERVATIONS UPON THE CHEMICAL COMPOSITION OF THE STARFISH ASTERIAS RUBENS L., WITH PARTICULAR REFERENCE TO STRONTIUM UPTAKE.**  
London Univ (England). Dept. of Zoology.  
J. Binyon.  
Journal of the Marine Biological Association of the United Kingdom, Vol. 58, p 441-449, 1978. 3 fig, 4 tab, 13 ref.

Descriptors: \*Chemical analysis, \*Invertebrates, \*Strontium, \*Adsorption, \*Animal physiology, Metals, Path of pollutants, Sodium Potassium, Calcium, Ions, Trace elements, Marine benthos, Tissue analysis, Asterias, \*Starfish, \*Echinoderms, Bioaccumulation.

The relative values of the body components of the starfish have been evaluated, together with a crude breakdown into total water, organic matter and skeletal material. The concentrations of sodium, potassium, calcium, and strontium in these tissues have been measured and, in the case of the latter two elements, the total ionic load carried by these tissues calculated. The effect of a short period of immersion in sea water containing an elevated level of strontium has shown that the soft tissues quickly reach a new equilibrium. The skeletal material shows little change in the short term and it is suggested that further strontium will only be incorporated when growth in that component occurs. (EIS-Katz)  
W78-10547

**CHRONIC AND SIMULATED USE-PATTERN EXPOSURES OF BROOK TROUT (SALVELINUS FONTINALIS) TO 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM).**  
Fish and Wildlife Service, Columbia, MO. National Fisheries Research Lab.  
For primary bibliographic entry see Field 5C.  
W78-10558

**THE HYDROPSYCHE TOXICITY TEST, TESTED WITH FENETH CARB, DERIVED FROM HYDROPSYCHE-TOXICITATSTEST, ERPROBT AN FENETHCARB.**  
Landessanstat fuer Umweltschutz (Baden-Wuerttemberg, Karlsruhe (West Germany)).  
W. K. Besch, I. Schreiber, and D. Herbst.  
Swiss Journal of Hydrology, Vol. 39(1), p 69-85, 1977. 11 fig, 8 ref. (English summary).

Descriptors: \*Bioassay, Toxicity, \*Methodology, \*Laboratory test, Laboratory equipment, Aquatic insects, \*Animal behavior, Insecticides, \*Carbamate pesticides, \*Fenethcarb, \*Sublethal concentrations, \*Hydropsyche, \*Nest-building, Toxicity tests.

Fenethcarb (3,5-diethyl-phenyl-N-methylcarbamate) was used to test how far the presence of toxins in various concentrations can cause changes in the net building behavior of *Hydropsyche angustipennis* (Trichoptera). To evaluate this, features of the net structure which could be measured and counted were used. The statistical significance of the results was calculated. (EIS-Katz)  
W78-10566

**ISOLATION OF XENOBIOTIC CHEMICALS FROM TISSUE SAMPLES BY GEL PERMEATION CHROMATOGRAPHY.**  
Environmental Research Lab.-Duluth, MN.  
D. W. Kuehl, and E. N. Leonard.  
Analytical Chemistry, Vol. 50, 1978, p 182-183, 2 tab, 2 fig, 10 ref.

Descriptors: \*Methodology, \*Laboratory techniques, Laboratory equipment, \*Analytical methods, Chromatography, Spectroscopy, \*Organic compounds, Organic wastes, Freshwater fish, Arochlor, Polychlorinated hydrocarbons, DDE, Chlorinated hydrocarbon pesticides, \*Path of pollutants, Polarographic analysis, Polar compounds, \*Low molecular weight organics.

Gel permeation chromatography is used to identify organic substances in the tissue of the fathead minnow. The objective of the study was to develop an efficient rapid method for the isolation of low molecular weight polar organics in fatty tissue for subsequent gas-liquid chromatographic-mass spectrometric analysis. (EIS-Katz)  
W78-10578

**THE SEA URCHIN EGG AS A TEST OBJECT IN OIL POLLUTION STUDIES.**  
Tromsø Univ. (Norway). Inst. of Biology and Geology.  
For primary bibliographic entry see Field 5C.

W78-10580

**TRACE METAL CONCENTRATIONS IN SOME ICELANDIC SEAWEEDS.**  
Slovenska Akademija Znanosti in Umetnosti, Ljubljana (Yugoslavia). Biological Inst.  
I. M. Munda.  
Botanica Marina Vol. XXI, 1978, p. 261-263. 1 tab, 12 ref.

Descriptors: \*Copper, \*Cobalt, \*Zinc, \*Manganese, Metals, Chemical analysis, Atlantic Ocean, \*Marine algae, Chemical analysis, Salinity, Icelandic waters, Fucus, \*Rhodophyceae, Phaeophyceae, Iceland.

The concentrations of the trace elements Co, Ca, Zn and Mn were determined in some red and brown algae from the Icelandic Coast. Differences between species were observed. In the case of fucooid species the question of salinity influence on the trace metal concentration was considered. (EIS-Katz)  
W78-10581

**PETROLEUM: EFFECTS ON MALLARD EGG HATCHABILITY.**  
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.  
For primary bibliographic entry see Field 5C.  
W78-10584

**DETERMINATION OF ORTHOPHOSPHATE IN AQUEOUS SOLUTIONS CONTAINING LABILE ORGANIC AND INORGANIC PHOSPHORUS COMPOUNDS.**  
Iowa Univ., Ames. Dept. of Agronomy.  
W. A. Dick, and M. A. Tabatabai.  
Journal of Environmental Quality, Vol. 6, No. 1, p 82-85, January-March 1977. 4 fig, 3 tab, 16 ref.

Descriptors: Sampling, Water quality, Water quality control, \*Phosphorus compounds, Laboratory tests, Fertilizers, Nutrients, \*Pollutant identification, \*Orthophosphates, \*Colorimetry, \*Phosphates.

A simple and precise colorimetric method of determining orthophosphate in aqueous solutions containing labile organic and inorganic P compounds is described. It involves a rapid formation of molybdenum blue color by the reaction of orthophosphate with molybdate ions in the presence of ascorbic acid-trichloroacetic acid and citrate-arsenite reagents and complexation of the excess molybdate ions to prevent further formation of blue color from the phosphate derived from hydrolysis of the acid-labile P compounds. The color is stable up to 24 hours. The method is sensitive and accurate, and it permits determination of microgram quantities of orthophosphate in samples and containing large amounts of acid-labile P compounds. Tests with a wide range of condensed phosphate and organic phosphate compounds showed that none of the P compounds studied interfered with this method. Results by this method are compared with those obtained by the method of Murphy and Riley. (Skogerboe-Colorado State)  
W78-10588

**AN ALKALINE OXIDATION METHOD FOR DETERMINATION OF TOTAL PHOSPHORUS IN SOILS.**  
Iowa State Univ., Ames. Dept. of Agronomy.  
For primary bibliographic entry see Field 2G.  
W78-10596

**EFFECT OF INORGANIC AND ORGANIC COMPOUNDS ON THE EXTRACTABILITY OF <sup>239</sup>PU FROM AN ARTIFICIALLY CONTAMINATED SOIL.**  
California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.  
For primary bibliographic entry see Field 2G.

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5A—Identification Of Pollutants

W78-10616

**THE ASSESSMENT OF PLANT-AVAILABLE CADMIUM IN SOILS,**  
Wye Coll., Ashford (England). Dept. of Physical Sciences.  
For primary bibliographic entry see Field 2G.  
W78-10617

**HYDROLOGIC MONITORING OF A DEEPWELL-INJECTION SYSTEM NEAR PENSACOLA, FLORIDA, MARCH 1970-MARCH 1977,**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
For primary bibliographic entry see Field 5B.  
W78-10625

**WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1976.**  
Geological Survey, Raleigh, NC. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10627

**WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1977.**  
Geological Survey, Towson, MD. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10628

**WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1977.**  
Geological Survey, Carson City, NE. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10629

**HYDROLOGIC RECONNAISSANCE OF THE YAMPA RIVER DURING LOW FLOW, DINOSAUR NATIONAL MONUMENT, NORTHWESTERN COLORADO,**  
Geological Survey, Lakewood, CO. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-10632

**SOME PROPERTIES OF THE GEOMETRIC MEAN AND ITS USE IN WATER QUALITY STANDARDS,**  
Geological Survey, Reston, VA. Water Resources Div.  
J. M. Landwehr.  
Water Resources Research, Vol 14, No 3, p 467-473, June 1978. 4 fig, 7 tab, 17 ref.

**Descriptors:** \*Water quality standards, \*Coliforms, \*Water analysis, \*Analytical techniques, \*Statistical methods, Properties, Sampling, Evaluation, Water sports, \*Swimming facilities, \*Geometric mean.

The geometric mean is often used to express acceptable levels of fecal coliform counts in Federal and State water quality criteria or standards. The expected value of the geometric mean is shown to be a function of the sample size and to be very sensitive to the skew as well as to the form of the underlying distribution function. Implications of these findings are discussed with regard to standards. In particular, it is noted that great care must be taken in specifying the minimal sample size to be used. (Woodard-USGS)  
W78-10641

**HYDROLOGIC RECONNAISSANCE OF THE DUGWAY VALLEY-GOVERNMENT CREEK AREA, WEST-CENTRAL UTAH,**  
Geological Survey, Salt Lake City, UT. Water Resources Div.

For primary bibliographic entry see Field 7C.  
W78-10644

**GROUNDWATER CONDITIONS IN UTAH, SPRING OF 1978,**  
Geological Survey, Salt Lake City, UT. Water Resources Div.  
For primary bibliographic entry see Field 2F.  
W78-10645

**ANALYSIS OF ORGANOCHLORINE COMPOUNDS IN EFFLUENTS FROM BLEACHERIES BY NEUTRON ACTIVATION ANALYSIS AND GAS CHROMATOGRAPHY/MASS SPECTROMETRY,**  
Central Inst. for Industrial Research, Oslo (Norway).  
A. Bjorseth, G. Lunde, and N. Gjøs.  
Acta Chemica Scandinavica, Vol. 31B, No. 9, p 797-801, 1977. 3 fig, 16 ref, 2 tab.

**Descriptors:** \*Bleaching wastes, \*Organic compounds, \*Chlorine compounds, \*Waste identification, Neutron activation analysis, Pulp wastes, Pulp and paper industry, Wastes, Industrial waste, Water pollution sources, \*Gas chromatography, \*Mass spectrometry, Sulfite liquors, Kraft mills, Sulfite pulp mills, Bromine compounds, Terpenes, Wood extractives, Phenols, \*Pollutant identification.

The total amounts of nonpolar and halogenated phenolic compounds in effluents from chlorine bleacheries of sulfite and kraft paper mills were investigated using neutron activation analysis. In the kraft mill, nonpolar (cyclohexane extractable) and phenolic (butyl acetate extractable) chlorinated compounds are present in concentrations of 0.36 and 1.7 ppm, respectively. In the sulfite mill, both chlorinated and brominated compounds are present in average concentrations of 0.67 ppm Cl and 0.06 ppm Br for nonpolar compounds and 1.1 ppm Cl and 0.1 ppm Br for phenolic compounds. The occurrence of organobromine compounds in the sulfite mill is due to the use of seawater in the first chlorination stage. The effluents were also analyzed by gas chromatography/mass spectrometry, and several halogenated aromatic hydrocarbons have been identified, including chloro-p-methylisopropylbenzene (2 isomers), dichloro-p-methylisopropylbenzene (2 isomers), bromo-p-methylisopropylbenzene, chloro-p-methylisopropylbenzene (2 isomers), and dichloro-p-methylisopropylbenzene (2 isomers), and dichloro-p-methylisopropylbenzene (2 isomers). These compounds are presumably formed by substitution reactions of the parent molecules which are formed by the cooking of the terpenes naturally present in wood. (Witt-IPC)  
W78-10670

**DEVELOPMENT OF AN EFFICIENT SAMPLING STRATEGY TO CHARACTERIZE DIGESTED SLUDGES,**  
Environmental Protection Service, Burlington (Ontario). Waste Water Technology Centre.  
For primary bibliographic entry see Field 5D.  
W78-10673

**EFFECT OF PH ON BIOASSAYS IN FRESH AND SEAWATER,**  
British Columbia Research Council, Vancouver.  
For primary bibliographic entry see Field 5C.  
W78-10680

**QUALITATIVE AND QUANTITATIVE DETERMINATION OF CHLORINATED ORGANIC COMPOUNDS IN BLEACHERY EFFLUENTS BY MEANS OF GAS CHROMATOGRAPHY-MASS SPECTROMETRY (QUALITATIVE UND QUANTITATIVE BESTIMMUNG VON CHLORIERTEN ORGANISCHEN VERBINDUN-**

**GEN IN BLEICHEREIABWASSERN MITTELS GASCHROMATOGRAPHIE-MASSENSPEKTROMETRIE),**  
Swedish Forest Products Research Lab, Stockholm.  
K. Lindstrom.  
Das Papier, Vol 31, No 12, p 517-525, December, 1977. 15 fig.

**Descriptors:** \*Bleaching wastes, \*Waste identification, \*Chlorine compounds, Pulp wastes, Wastes, Industrial wastes, Water pollution sources, \*Pollutant identification, \*Gas chromatography, Spectroscopy, Pulp and paper industry, Organic compounds, Aromatic compounds, Phenols, Sweden, Foreign countries, \*Mass spectrometry.

The chemical composition of pulp mill bleachery effluents is very complicated. This investigation, conducted at the Swedish Forest Products Research laboratory, Stockholm, Sweden, has identified 14 chlorinated phenols in the phenol fraction of a bleachery effluent with the help of a gas chromatograph/mass spectrometer computer system. The phenols were ethylated and analyzed. The compounds found were dichloro-phenol, 2,4,6-trichlorophenol, three isomeric dichloroguaiacols, four isomeric trichloroguaiacols, dichlorocatechol, trichlorocatechol, tetrachloroguaiacol, monochloropropionanillone, and tetrachlorocatechol. (Ward-IPC)  
W78-10688

**DETERMINATION OF INORGANIC CHLORINE COMPOUNDS AND TOTAL CHLORINE IN SPENT BLEACHING LIQUORS. PART 2. SPECTROPHOTOMETRIC METHODS FOR CHLORINE DIOXIDE AND CHLORINE,**  
Swedish Forest Products Research Lab, Stockholm.  
L. Sjostrom, and D. Tormund.  
Svensk Papperstidning, Vol 81, No 4, p 114-120, March 10, 1978. 3 fig, 12 ref, 5 tab.

**Descriptors:** \*Bleaching wastes, \*Waste identification, \*Spectrophotometry, \*Chlorine compounds, Wastes, Industrial wastes, Water pollution sources, Chlorine, Pulp wastes, Pulp and paper industry, Analytical techniques, Inorganic compounds, Lignins, Suspended solids, Chlorine dioxide.

The method described permits the quantitative determination of chlorine dioxide (directly) plus chlorine (indirectly or via active chlorine determination) in bleach plant effluents. The absorbance of chlorine dioxide in the UV range is measured at its maximum (357 nm) and corrected for absorbances of chlorine, lignin compounds, and suspended solids (at 322, 278, and 500 nm). If chlorine is a major component, the active chlorine is first determined titrimetrically; chlorine dioxide is then analyzed spectrophotometrically, and the chlorine concentration is calculated from the difference. If chlorine is a minor constituent, the recommended procedure utilizes the reaction of chlorine with chlorite in acid solution; it yields a molar quantity of chlorine dioxide which is exactly twice that of the chlorine. The sample is treated with a chlorite solution, and the chlorine dioxide concentration is determined spectrophotometrically, once before and once after the treatment; the chlorine concentration of the sample is then calculated from the difference. The proposed methods have given satisfactory results on actual spent bleaching liquors and on synthetic chlorine/chlorine dioxide mixture. The procedure is highly selective, permitting a smallest amount either component to be analyzed in the presence of a large excess of the other component. The accuracy is satisfactory for concentrations down to 0.1 millimole/liter. (Brown-IPC)  
W78-10694

# WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

## Identification Of Pollutants—Group 5A

**BIOASSAY DATA FOR MARINE POLLUTION USING SEA URCHIN EGGS, 1974,**  
Seto Marine Biological Lab. (Japan).  
N. Kobayashi.  
Publications of the Seto Marine Biological Laboratory, Vol 22, p. 405-407, 1976. 5 tab.

Descriptors: \*Bioassay, Toxicity, \*Methodology, \*Marine benthos, \*Water quality, Monitoring, Laboratory tests, Seasonal, Juvenile growth stages, Eggs, Pacific Ocean, Inhibition, \*Japan, Sea Urchins, Developmental stages.

Bioassays were made with sea urchin eggs to evaluate marine pollution in the vicinity of the Seto Marine Biological Laboratory. The degree of inhibitory effect was greatest near the bottom. (Katz-EIS)  
W78-10744

**VARIABILITY OF AQUATIC MODEL ECOSYSTEM-DERIVED DATA,**  
Agricultural Research Lab., Beltsville, MD. Pesticide Degradation Lab.  
A. R. Isensee.  
International Journal of Environmental Studies. Vol 10, p. 35-41, 1976. 5 tab, 15 ref.

Descriptors: \*Herbicides, \*Bioassay, Laboratory test, Methodology, Environmental effects, Water analysis, Algae, Snails, \*Daphnia, Freshwater fish, Radiochemical analysis, Organic compounds, Path of pollutants, Food chain, Statistical analysis, \*Arsenic compounds, \*Bioaccumulation, \*Diuron, Endothal, 2,4,5-T, Atrazine, Mirex, 14C-Cacodylic acid.

Experiments were conducted to determine the bioaccumulation potential of several pesticides in aquatic model ecosystems and the variability of these results. Bioaccumulation ratios were low for four herbicides (10 to 290), intermediate (320 to 3740) for hexachlorobenzene and high (2580 to 14,550) for mirex. Coefficients of variation (CV) averaged 30 to 40 percent with a range of one to 75 percent. This model ecosystem derived data was about twice as variable as microcosm metabolism measurements and single species experiments, but one half to one fourth as variable as microcosm population responses. (Katz-EIS)  
W78-10746

**GAS CHROMATOGRAPHIC ANALYSIS OF BERYLLIUM IN THE MARINE SYSTEM. INTERFERENCE, EFFICIENCY, APPARENT BIOLOGICAL DISCRIMINATION AND SOME RESULTS,**  
Alaska Univ., College. Inst. of Marine Science.  
T. A. Gosink.  
Marine Science Communications Vol 2, No 3 and 4, p 183-199, 1976. 1 fig, 7 tab, 12 ref.

Descriptors: \*Beryllium, \*Metals, Water pollution effects, Alaska, Water quality, \*Mining wastes, Mining industry, Gas chromatography, Methodology, \*Calcium, Analytical techniques, Water analysis, Mussels, Molluscs, Crustaceans, Clams, \*Biological discrimination, \*Gulf of Alaska, \*Barnacles, Sea Urchins, Echinoderms, Fossils.

Electron capture detection gas chromatography offers the most sensitive instrumental method for the detection of beryllium. Analytical problems including calcium interference and extraction efficiencies for the trifluoroacetylacetone derivative are discussed. Analyses indicate that calcareous marine organisms virtually exclude beryllium from their structure, even in areas where the element is naturally, relatively abundant, and that the concentrations present are on the outer periderm or epithelial layer with its assorted bacteria. (Katz-EIS)  
W78-10750

**WATER QUALITY COMPARISON STUDY, ESCAMBIA RIVER AND OTHER NORTHWEST FLORIDA STREAMS.**  
Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.  
Available from the National Technical Information Service, Springfield, Virginia 22161 as PB-255 162. January, 1972, 14 p.

Descriptors: \*Florida, \*Organic compounds, Water properties, \*Water quality, Aerobic conditions, Carbon, Coliforms, Color, Dissolved oxygen, Nitrogen, Nutrients, Phosphorus, Physical properties, Turbidity, Water pollution, Water quality control, Rivers, Streamflow, Waste disposal.

A limited survey was conducted by the Environmental Protection Agency to produce data for use in comparing the water and nutrient quality of the Escambia River with other streams in the northwest Florida area. The relative nitrogen, phosphorus, and organic concentrations were of particular interest. The study area was between and included the Perdido and Choctawhatchee River Basins. Streams in this area drain the Florida panhandle and extreme Southern Alabama. Land use is primarily agriculture and forestry. There was strong evidence that quality among all the streams studied was comparable. At low flow, the results of waste discharge from the Container Corporation at Brewton, Alabama were evident in the increased color and total organic carbon values in the Escambia River. However, the study concluded that when concentration for various water quality constituents are converted to loading (lbs./day), there will be an appreciable difference among river basins in the study area. Differences among the estuarine ecosystems for each river basin are to be expected - possibly as a result of differing streamflow. Therefore, enforcement actions should be formed on controllable factors rather than on effect of flow which is largely a natural phenomenon. (Jordan-Florida).  
W78-10759

**FEASIBILITY STUDY FOR DEVELOPMENT AND IMPLEMENTATION OF A MODEL STATE INFORMATION SYSTEM (M.S.I.S.) FOR EPA'S SAFE DRINKING WATER PROGRAM.**  
American Management Systems, Inc. Arlington, VA.  
For primary bibliographic entry see Field 5G.  
W78-10762

**INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS).**  
American Management Systems, Inc., Arlington, VA.  
For primary bibliographic entry see Field 5G.  
W78-10810

**MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM, VOLUME II: EXHIBITS.**  
American Management Systems, Inc., Arlington, VA.  
For primary bibliographic entry see Field 5G.  
W78-10811

**A TWO-ELEMENT CERAMIC SENSOR FOR MATRIC POTENTIAL AND SALINITY MEASUREMENTS,**  
Forest Service (USDA), Albuquerque, NM. Rocky Mountain Forest and Range Experimental Station.  
For primary bibliographic entry see Field 2G.  
W78-10921

**EFFECTS OF TRACE CONTAMINANTS FROM COAL COMBUSTION.**  
Department of Energy, Washington, DC. Div. of Biomedical and Environmental Research.  
For primary bibliographic entry see Field 5B.

W78-10926

**WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS.**  
National Sanitation Foundation, Ann Arbor, MI. Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 328. Price codes: A12 in paper copy, A01 in microfiche. Research Report, May 1971. 201 p, 48 fig, 19 tab, 69 ref. EPA 1R01 EC00318-01 and -02.

Descriptors: \*Monitoring, \*Water quality, \*Potable water, \*Pollutant identification, Electrodes, Equipment, Sampling, Ions, Cations, Hydrogen ion concentration, Hardness (Water), Nitrates, Chlorides, Fluorides, Calcium carbonate, Trace elements, Heavy metals, Organic compounds, Chlorine, Turbidity.

The overall objective of this project was to develop basic scientific criteria and specifications for a continuous monitoring system for use in the detection and control of water quality deterioration in distribution systems, and in quality control of water purification processes. Specific aims included: (1) developing new sensor systems, (2) establishing the analytical feasibility of commercially available sensors for potable water quality monitoring applications, and (3) evaluating under laboratory and field conditions the performance characteristics of each sensor in the system. This report discussed the evaluating of the sensors. The sensors reported were for the measurement of these parameters: (1) ions, (2) hardness, (3) nitrates, (4) chlorides, (5) fluorides, (6) calcium carbonate, (7) trace metals, (8) gross organics, (9) residual chlorine, and (10) turbidity. (See also W78-06284) (Sims-ISWS)  
W78-10927

**LOCALLY HEAVY SNOW DOWNWIND FROM COOLING TOWERS,**  
National Weather Service Forecasting Office, Charleston, WV.  
For primary bibliographic entry see Field 4C.  
W78-10942

**SEDIMENT OXYGEN DEMAND STUDIES OF SELECTED NORTH-EASTERN ILLINOIS STREAMS,**  
Illinois State Water Survey, Urbana.  
For primary bibliographic entry see Field 2J.  
W78-10943

**CHEMICAL CHARACTERISTICS OF A DESERT STREAM IN FLASH FLOOD,**  
Arizona State Univ., Tempe. Dept. of Zoology.  
For primary bibliographic entry see Field 2K.  
W78-10964

**BIOGENIC HYDROCARBONS AND PETROLEUM FRACTIONS,**  
Institut Francais du Pétrole, Rueil-Malmaison (France).  
C. Bovard, C. Gatellier, N. Petroff, Ph. Renault, and J. C. Roussel.  
Rapports et Procès-Verbaux des Reunions, Conseil International pour l'Exploration de la Mer, Vol. 171, p 91-93, 1977. 21 ref.

Descriptors: \*Oil, \*Carbon radioisotopes, \*Carbon cycle, \*Organic compounds, \*Phytoplankton, \*Algae, \*Pollutant identification, \*Chemical analysis, Analytical techniques, Chromatography, Cyanophyta, \*Biogenic hydrocarbons, \*Alkanes, Sarcinina.

Knowledge of the differences between biogenic hydrocarbons and those from petroleum is reviewed, and the problem of making this differentiation are discussed. The value of 14C techniques is considered in some cases. (EIS-Katz)  
W78-11001



## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5A—Identification Of Pollutants

**POLLUTION EFFECTS ON INTERTIDAL MACROBENTHIC COMMUNITIES,**  
Napier Coll. of Commerce and Technology Edinburgh (Scotland).  
For primary bibliographic entry see Field 5C.  
W78-11007

**THE APPROACHING CRISIS IN THE REGISTRATION OF FISHERY CHEMICALS,**  
Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.  
For primary bibliographic entry see Field 5G.  
W78-11008

**DETERMINATION OF PCB AND PCT RESIDUES IN FISH BY TISSUE ACID HYDROLYSIS AND DESTRUCTIVE CLEAN-UP OF THE EXTRACT,**  
Public Health Inst. of Slovenia Ljubljana (Yugoslavia).  
J. Jan, and S. Malneric.  
Bulletin of Environmental Contamination and Toxicology. Vol. 19, p 772-780, 1978. 3 fig, 1 tab, 26 ref.

Descriptors: \*Polychlorinated biphenyls, \*Chemical analysis, Analytical techniques, \*Hydrolysis, \*Pollutant identification, Organic compounds, Pesticide residues, Fish physiology, Gas chromatography, Chemical reactions, Chlorination, Trout, Acids, Chemicals, Tissue analysis, \*Polychlorinated terphenyl.

This investigation shows that preliminary acid hydrolysis of fish tissue increases the efficiency of subsequent extraction of PCB-PCT residues. The experimental data indicates that the analyst has to be aware that the destructive clean-up can influence some PCB-PCT isomers. On the other hand, the destructive method has proved to be practicable for the clean-up of fish extracts; especially because they eliminate some coextracting compounds from biological material. The usefulness of the perchlorination procedure is accepted because it eliminates some other residues which could interfere on PCB-PCT total peak area quantification. (EIS-Katz)  
W78-11009

**CADMIUM IN NORTHEAST PACIFIC WATERS,**  
California Univ. Santa Cruz. Div. of Natural Sciences.  
For primary bibliographic entry see Field 5B.  
W78-11011

**THE SUB-LETHAL EFFECTS OF WATER-SOLUBLE EXTRACTS OF CRUDE OIL ON THE FERTILISATION AND DEVELOPMENT OF FUCUS SERRATUS L. (SERRATED WRACK),**  
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.  
For primary bibliographic entry see Field 5C.  
W78-11015

**WATER SOLUBLE EXTRACTIVES FROM PETROLEUM OILS: CHEMICAL CHARACTERIZATION AND EFFECTS ON MICROALGAE AND MARINE ANIMALS,**  
Texas Univ. at Austin, Port Aransas. Marine Science Inst.  
For primary bibliographic entry see Field 5C.  
W78-11017

**PHENOL POISONING DUE TO CONTAMINATED DRINKING WATER,**  
Bureau of Epidemiology, Atlanta, GA. Cancer and Birth Defects Div.  
For primary bibliographic entry see Field 5C.  
W78-11075

**INTERLABORATORY QUALITY CONTROL STUDY NO. 14 MAJOR IONS: CALCIUM, MAGNESIUM, SODIUM POTASSIUM, HARDNESS, ALKALINITY, CHLORIDE, SULPHATE AND NITRATE,**  
Canada Centre for Inland Waters, Burlington (Ontario).  
J. M. Carron, and K. I. Aspila.  
Report Series No. 51, 1978, 29 p, 9 fig, 5 ref, 14 tab, 2 append.

Descriptors: \*Ions, \*Water quality control, \*Laboratory tests, \*Sampling, \*Absorption, Hardness(Water), Alkalinity, Analysis, Parametric hydrology.

The results of interlaboratory quality control study No. 14 are described. This study was carried out during the spring and summer of 1975. It included three natural waters and two standard solutions. Data were submitted from 36 participating Canadian laboratories. The parameters were calcium, magnesium, sodium, potassium, hardness, alkalinity, chloride, sulphate and nitrate. Samples were at concentrations similar to natural inland waters. All samples were distributed without preservatives. (WATDOC)  
W78-11191

**TURBULENT DIFFUSION PROCESSES IN THE GREAT LAKES,**  
Canada Centre for Inland Waters, Burlington (Ontario).  
For primary bibliographic entry see Field 2H.  
W78-11193

**INTERLABORATORY QUALITY CONTROL STUDY NO. 15 TOTAL PHOSPHORUS IN NATURAL WATERS,**  
Canada Centre for Inland Waters, Burlington (Ontario).  
K. I. Aspila, and J. M. Carron.  
Report Series No. 52, 1978, 10 p, 3 fig, 5 ref, 7 tab, 2 append.

Descriptors: \*Laboratory tests, \*Phosphorus, \*Quality control, \*Water sampling, \*Water properties, Data collections, Analytical techniques.

The purpose of this study was to provide test samples to Canadian laboratories engaged in analysis of total phosphorus in natural water samples and to use the results to comment on the comparability of the data and the methods employed. The analytical data in this report were obtained from December 1975 to July 1976. Thirty-two laboratories participated. The analytical methods used by participants for total phosphorus analysis were very diverse. For the overall results, the interlaboratory standard deviation for the five test samples varied from about 0.0007 mg per L to 0.045 mg per L. P. Laboratories known to analyze for total phosphorus on a regular basis demonstrated better precision and accuracy than laboratories which only did such analyses occasionally. (WATDOC)  
W78-11194

**ATMOSPHERIC BULK PRECIPITATION IN THE LAKE ERIE BASIN,**  
Canada Centre for Inland Waters, Burlington (Ontario).  
K. W. Kuntz.  
Report Series No. 56, 1978, 7 p, 4 fig, 6 ref, 6 tab.

Descriptors: \*Precipitation(Atmospheric), \*Chemical analysis, \*Lake Erie, \*Sampling, Filters, Data collections, Winter, Summer, Water pollution, Wastes, \*Loading calculations.

A wide variety of chemical constituents of atmospheric bulk precipitation in the Lake Erie Basin have been analyzed on a monthly basis since 1970. Data are compared on the basis of summer months (April to November inclusive) and winter months (December to March inclusive) and on the

basis of sampler type. Concentrations for specific conductance, total Kjeldahl nitrogen, total phosphorus, and potassium are significantly higher in summer samples as a result of contamination by soil particles, insects, bird feces and windblown debris. Variations between samplers showed that in summer only sodium was significantly higher in the 'Type A' samplers, probably because of the use of a glass wool prefilter from 1970 to July 1974. In winter, nitrate-nitrogen, extractable zinc, sodium and sulphate are significantly higher and total phosphorus is significantly lower in the 'Type A' sampler. These high concentrations of sodium and sulphate and the low concentrations of total phosphorus are also attributed to the use of the glass wool prefilter. From these data, atmospheric loading estimates to the lake surface are calculated and compared with those of an independent analysis and also with 1975 Detroit River loadings to Lake Erie. This comparison shows that the atmosphere is a significant source of nitrogen for Lake Erie. (WATDOC)  
W78-11195

**RECOVERY OF SANITARY-INDICATOR BACTERIA FROM STREAMS CONTAINING ACID MINE WATER,**  
West Virginia Univ., Morgantown. Water Research Inst.  
M. L. Savio, J. A. Double, and G. K. Bissonnette.  
Available from the National Technical Information Service, Springfield, VA 22161, as PB-285 962, price codes: A03 in paper copy, A01 in microfiche. Information Report 11, (WRI-WVU-78-02), 1978. 30 p, 2 fig, 15 tab, 54 ref. OWRT-A-033-WVA(2), 14-34-0001-6051.

Descriptors: \*Acid mine water, Analytical techniques, \*Bioindicators, \*Coliforms, \*E. coli, \*Sewage bacteria, Domestic wastes, Membrane processes, Microorganisms, Mine water, Sewage effluents, Testing procedures, Water pollution, Water quality, Pollutant identification, Waste identification, Bacterial-recovery methods, Enriched culture media.

Bacteriological studies were conducted on several streams affected by acid-mine water and organic-waste pollution. Conventional membrane filtration techniques were inadequate to recover sublethally injured coliforms from such environments when compared to recovery obtained by multiple-tube fermentation techniques. Substantially enhanced recovery of injured coliforms resulted upon the inclusion of an enrichment step when using the membrane filtration procedure. Qualitatively, several members of the Enterobacteriaceae were identified. Quantitative detection of fecal streptococci from the streams affected by acid-mine water was accomplished with relative ease, indicating that consideration should be given to employing this group as reliable indicators of bacteriological quality of aquatic environments affected by acid-mine drainage. Qualitatively, all members of the fecal streptococcal group were isolated from the streams affected by acid-mine water, with the exception of *Streptococcus bovis* and *Streptococcus equinus*. 'Total' plate counts reflected negligible differences in quantitative detection of bacteria as a function of three different incubation temperatures (10, 20, and 35°C). Prolonged incubation of the 'total' bacteria plates gave rise to chromogenic colonies. The numbers of chromogenic colonies on the plates were correlated with the relative absence or presence of acid mine water.  
W78-11217

**REFRACTORY ORGANIC COMPOUNDS IN TREATED EFFLUENT AND THEIR REMOVAL BY SOIL, MILILANI, OAHU, HAWAII,**  
Hawaii Univ. Honolulu. Water Resources Research Center.  
C. Fischer, R. E. Green, and N. C. Burbank, Jr.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 928,

Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 115, December 1977. 39 p, 10 figs, 5 tab, 31 ref, append. OWRT A-058-HI(1), 14-34-0001-6012, 7025, 7026.

Descriptors: \*Sewage effluent, \*Organic compounds, \*Adsorption, \*Soils, \*Resins, Chlorination, Effluent reuse, Irrigation water, Sugarcane, Gas chromatography, \*Hawaii, Pollutant identification, \*XAD-2 resin, Mililani, Oahu.

Increased water consumption on O'ahu has encouraged the use of treated sewage effluent for irrigation. This study seeks to identify organic compounds in treated effluent and to determine if such compounds are adsorbed by soil so that the groundwater is not adversely affected. XAD-2 resin is used to extract and concentrate trace organic compounds in treated effluent. Electron capture gas chromatography and combined gas chromatography-mass spectrometry (GC/MS) indicate that some of the organic compounds in the treated effluent are chlorinated. Gas chromatography tests also confirm the presence of naphthalene and bromobenzene in the treated effluent. Organic compounds which could be detected by electron capture gas chromatography data are effectively removed by the Lahaina soil when the treated effluent is applied as irrigation water to a sugarcane field. On the other hand, GC/MS results indicate that the Lahaina soil only partially adsorbs organics, such as paraffins and steroids. Laboratory measurements of adsorption of organic compounds from effluent do not adequately represent the extent of adsorption measured in the field. W78-11220

**GEOCHEMISTRY OF THE MATTOLE RIVER OF NORTHERN CALIFORNIA**, Geological Survey, Menlo Park, CA. Water Resources Div.

For primary bibliographic entry see Field 2K. W78-11255

**DETERMINATION OF DISSOLVED BORON IN FRESH, ESTUARINE, AND GEOTHERMAL WATERS BY D.C. ARGON-PLASMA EMISSION SPECTROMETRY**, Geological Survey, Menlo Park, CA. Water Resources Div. and Geological Survey, Menlo Park, CA. Geologic Div. J. W. Ball, J. M. Thompson, and E. A. Jenne. Analytica Chimica Acta, Vol 98, p 67-75, 1978. 1 fig, 6 tab, 17 ref.

Descriptors: \*Water analysis, \*Boron, \*Analytical techniques, \*Spectrometers, Freshwater, Estuaries, Geothermal studies, Trace elements, Evaluation, \*d. c. argon plasma spectrometer, \*Carmine method.

A d.c. argon-plasma emission spectrometer is used to determine dissolved boron in natural (fresh and estuarine) water samples. Concentrations ranged from 0.02 to 250 mg/liter. The emission-concentration function is linear from 0.02 to 1000 mg/liter. Achievement of a relative standard deviation of less than or equal to 3 percent requires frequent restandardization to offset sensitivity changes. Dilution may be necessary to overcome high and variable electron density caused by differences in alkali-metal content and to avoid quenching of the plasma by high solute concentrations of sodium and other easily ionized elements. The proposed method was tested against a reference method and found to be more sensitive, equally or more precise and accurate, less subject to interferences, with a wider linear analytical range than the carmine method. Analyses of standard reference samples yielded results in all cases within one standard deviation of the means. (Woodard-USGS) W78-11256

**MONITORING WATER-QUALITY DURING PILOT DREDGING IN THE WILLAMETTE AND COLUMBIA RIVERS, OREGON**, Geological Survey, Portland, OR. Water Resources Div.

J. F. Rinella, and S. W. McKenzie. Open-file report 78-554, 1978. 16 p, 1 fig, 9 tab, 7 ref.

Descriptors: \*Dredging, \*Environmental effects, \*Water quality, \*Columbia River(Ore), Bottom sediments, Water analysis, Physical properties, Chemical analysis, Nutrients, Suspended solids, Particle size, \*Willamette River(Ore).

Water quality was monitored in the Willamette and Columbia Rivers during a pilot dredging operation on December 16, 1977. Monitoring included in-situ measurements of pH, temperature, dissolved oxygen, and conductivity in the Willamette and Columbia Rivers; analyses of dissolved ammonia, dissolved manganese, suspended-sediment concentration and particle size, loss on ignition, and total organic carbon in river-water samples; and analyses of percent moisture, particle size, density, selected nutrients, total organic carbon, and loss on ignition in dredged material and barge-overflow samples. (Woodard-USGS) W78-11261

**GROUNDWATER DATA FOR THE SALT BASIN, EAGLE FLAT, RED LIGHT DRAW, GREEN RIVER VALLEY, AND PRESIDIO BOLSON IN WESTERNMOST TEXAS**, Geological Survey, Austin, TX. Water Resources Div.

For primary bibliographic entry see Field 7C. W78-11276

**TRACE METAL CONCENTRATIONS AND PARTITIONING IN ZOOPLANKTON, NEUSTON, BENTHOS FROM THE SOUTH TEXAS OUTER CONTINENTAL SHELF**, Texas A and M Univ., College Station. Dept. of Oceanography.

For primary bibliographic entry see Field 5C. W78-11285

## 5B. Sources Of Pollution

**SENSITIVITY ANALYSIS OF GENERALIZED STREETER-PHELPS MODELS**, Consiglio Nazionale delle Ricerche, Milan (Italy). Centro Teoria dei Sistemi. S. Rinaldi, and R. Soncini-Sessa. Advances in Water Resources, Vol. 1, No. 3, p 141-146, March 1978. 7 fig, 5 ref.

Descriptors: \*Biochemical oxygen demand, \*Dissolved oxygen demand, \*Dissolved oxygen, \*Model studies, Mathematical models, Water pollution, Temperature, Water temperature, Thermal pollution, Flow, Analytical techniques, Foreign research, \*Streeter-Phelps models, Sensitivity analysis.

The aim was twofold: first, to show how the sensitivity of a given river quality model can be analyzed by means of the so-called sensitivity theory. For this, the main ideas of sensitivity theory were surveyed; and then in the rest of the paper the theory was applied as an exercise to simple Streeter-Phelps models. Second, it was pointed out that the result of this study proves that Streeter-Phelps models are flexible and abound with relevant consequences if one knows how to analyze them. (Sims-ISWS) W78-10516

**ON THE SPREADING OF POWER PLANT COOLING WATER IN A TIDAL RIVER APPLIED TO THE RIVER ELBE**, Swedish Meteorological and Hydrological Inst., Norrköping.

I. Bork, and E. Maier-Reimer.

Advances in Water Resources, Vol. 1, No. 3, p 161-168, March 1978. 8 fig, 15 ref.

Descriptors: \*Thermal pollution, \*Cooling water, \*Powerplants, \*Model studies, Mathematical models, Monte Carlo method, Rivers, Estuaries, Nuclear powerplants, Heated water, Diffusion, Dispersion, Temperature, Water temperature, Heat transfer, Hydrodynamics, \*Elbe River(Germany).

By means of a simple one-dimensional model, some basic features of the spreading of cooling water were discussed. Based on the idea of equilibrium temperature, a numerical technique for the simulation of diffusion and cooling processes was presented. The technique was applied to a two-dimensional time-dependent model of the tide in the lower river Elbe. The measurements at the outlet of an existing nuclear power plant (Stade) were reproduced quantitatively. (Sims-ISWS) W78-10518

**VORTEX PAIRS AND POWER STATION COOLING WATERS**, Central Electricity Generating Board, Leatherhead (England). Central Electricity Research Labs.

J. F. MacQueen.

Advances in Water Resources, Vol. 1, No. 3, p 169-174, March 1978. 5 fig, 13 ref.

Descriptors: \*Thermal pollution, \*Cooling water, \*Powerplants, \*Model studies, Mathematical models, Estuaries, Coasts, Heated water, Mixing, Dispersion, Vortices, Water circulation, Water temperature, Buoyancy, Turbulence.

Cooling water discharged from power stations in the United Kingdom frequently is released from an outlet in an estuary or the sea. The warm water forms a thermal plume which is slightly buoyant and which spreads horizontally over the water surface while mixing vertically downwards with the cooler ambient water. In this paper, the possibility of vortex pair production at the cooling water outlet was considered as a mechanism contributing to this spreading of the warm water. The motion of a vortex pair contained between two rigid plane boundaries is an idealization of the flow between the water surface and the sea bed. The resulting motion was calculated from potential theory, and viscous effects were neglected. The problem of deciding what strength to assign the vortices was discussed, and specific consideration of shear and buoyancy at the outlet was detailed. It was observed that bifurcation of the vortex pair is determined by the initial position of the vortices and is unlikely to occur in conditions relevant to United Kingdom power station discharges. It was calculated that, in absence of turbulence, the motion of such vortex pairs would result in horizontal spreading of the warm water which is greater than that observed at site surveys. It was concluded that turbulence in the ambient receiving water is sufficient to destroy vortices produced by the discharge during the early stages of the plume development. (Sims-ISWS) W78-10519

**NONPOINT SOURCES: STATE-OF-THE-ART OVERVIEW**,

Texas A and M Univ., College Station.

J. M. Sweeten, and D. L. Reddell. Transactions of the American Society of Agricultural Engineers, Vol 21, No 3, p 474-483, May-June 1978. 3 fig, 2 tab, 62 ref.

Descriptors: \*Water pollution sources, Agriculture, \*Pollutants, Nutrients, Nitrogen, Phosphorus, Biochemical oxygen demand, Chemical oxygen demand, Sediments, Erosion, Farm management, Pesticides, Farm wastes, Feed lots, Water pollution, Path of pollutants, \*Nonpoint pollution sources.

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5B—Sources Of Pollution

During the past few years, the term nonpoint pollution source has become exceedingly important to agriculture. In 1972, Federal legislation (Public Law 92-500) was passed bringing many forms of agriculturally related nonpoint pollution under regulatory authority. Section 208 of Public Law 92-500 created a cooperative local/state/Federal system for areawide water quality planning. Nonpoint pollution sources are a major concern to these Section 208 planners. During the past, both basic and applied research have been conducted on such classical soil and water conservation topics as erosion control, sediment transport, soil chemistry and physics, crop production, range management, agricultural chemicals, animal science, and forestry. The challenge today is to locate, interpret, and compile this past knowledge into forms useful for Section 208 planners. This paper reviewed the current knowledge concerning the occurrence of nonpoint pollution sources such as sediment, nutrients, pesticides, and fecal contaminants. Sediment transport equations were reviewed and described, and the pollution potential of range and pasture livestock production was discussed. (Sims-ISWS) W78-10524

**LIQUID AND WATERBORNE WASTES RESEARCH IN NEW ZEALAND 1976**, National Water and Soil Conservation Organization, Christchurch (New Zealand). S. F. Davis. Water and Soil Technical Publication No. 1, p 18, (1977).

Descriptors: \*Pollutants, \*Wastes, \*Water pollution, \*Water pollution sources, \*Projects, Research and development, Sampling, Surveys, Foreign countries, Farm wastes, Foreign research, Industrial wastes, Municipal wastes, Waste water treatment, Sewage treatment, Water quality, \*New Zealand.

Research projects relating to liquid and waterborne wastes conducted by organizations in New Zealand during 1976 were listed. These projects were classified by subject and by organization. Addresses of contributors to this report were listed. Wastewater treatment and industrial wastes were the principal subjects for classification. (Sims-ISWS) W78-10530

**WATER QUALITY RESEARCH IN NEW ZEALAND 1976**, National Water and Soil Conservation Organization, Christchurch (New Zealand). For primary bibliographic entry see Field 5G. W78-10531

**DISPERSION OF POLLUTANTS IN CHANNELS WITH NON-UNIFORM VELOCITY DISTRIBUTION**, Nova Scotia Technical Coll., Halifax (Nova Scotia). Dept. of Chemical Engineering. S. T. Wang, A. F. McMillan, and B. H. Chen. Water Research, Vol 12, No 6, p 389-394, 1978. 5 fig, 11 ref.

Descriptors: \*Water pollution, \*Dispersion, \*Pollutants, \*Model studies, Mathematical models, Channels, Channel flow, Unsteady flow, Path of pollutants, Mixing, Diffusion, Convection, Rivers, Streams, Pollutant concentration.

The concentration distribution of a pollutant arising from an instantaneous point source in a two dimensional water channel with non-uniform velocity distribution was obtained by employing Gill's method to solve the convection-diffusion equation. The solution was illustrated by plotting equi-concentration curves for three positions of the flow velocity maximum of the stream while the pollutant source position was held fixed. It was found that the position of the maximum has a great

influence on the concentration distribution of the pollutant, particularly in the transverse direction. A velocity profile was proposed for fitting experimental flow data, and procedures for fitting were outlined. (Sims-ISWS) W78-10533

**THE MUSSEL MYTILUS EDULIS AS A BIOASSAY ORGANISM FOR MERCURY IN SEA-WATER**, Marine Lab., Aberdeen (Scotland). For primary bibliographic entry see Field 5C. W78-10537

**THE AMOCO CADIZ OIL SPILL**, Cremer and Warner, London, (England). For primary bibliographic entry see Field 5C. W78-10538

**COMPOSITION AND SOURCES OF POLLUTANT HYDROCARBONS IN THE SEVERN ESTUARY**, Bristol Univ. (England). Organic Geochemistry Unit. S. Thompson, and G. Eglington. Marine Pollution Bulletin, Vol. 9, p 133-136, 1978. 2 fig, 2 tab, 20 ref.

Descriptors: \*Oil pollution, \*Oil, \*Bottom sediments, \*Biodegradation, \*Fossil fuels, Aromatic compounds, Organic compounds, Water pollution sources, Path of pollutants, Chemical analysis, Chromatography, Air pollution, Runoff, Estuaries, \*Crude oil, \*Carcinogens, \*Aliphatic compounds, Benzo(a)pyrene.

Hydrocarbon distributions in sediment from the Severn Estuary can be explained mainly in terms of a pollution origin. The aliphatic hydrocarbon distribution is similar to that found in biodegraded crude oils. The distribution of polycyclic aromatic hydrocarbons, including the carcinogens benzo(a)pyrene, is similar to that derived from the pyrolysis of fossil fuels, especially petroleum. (EIS-Deal) W78-10542

**TOTAL AND ORGANIC MERCURY IN BENTHIC ORGANISMS NEAR A MAJOR SUBMARINE WASTEWATER OUTFALL SYSTEM**, Southern California Coastal Water Research Project, El Segundo. R. P. Eganhouse, and D. R. Young. Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 758-766, 1978. 3 fig, 5 tab, 14 ref.

Descriptors: \*Mercury, \*Benthic fauna, \*Municipal wastes, \*Outfall sewers, Heavy metals, Sediments, Industrial wastes, Crabs, Snails, Path of pollutants, Animal metabolism, Biodegradation, California, Marine benthos, Commercial fish, Marine fish, Waste disposal, Waste dilution, Tissue analysis, Bioaccumulation, \*Methylmercury, Los Angeles, California.

Selected tissues of Dover sole, crab, prawn, snail, urchin, and sea slug were analyzed for total and organic mercury content. While the regional sediments were highly contaminated with mercury from a Los Angeles County municipal wastewater outfall, the tissue concentrations in these benthic organisms were low and apparently similar to those found for related animals from other parts of the world. In no instance did a specimen exceed the U.S. Food and Drug Administration guideline for edible seafood of 0.5 ppm mercury. (EIS-Deal) W78-10544

**THE USE OF PERIPHYTON AS A MONITOR OF TRACE METALS IN TWO CONTAMINATED INDIANA LAKES**, Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.

For primary bibliographic entry see Field 5C. W78-10545

**TRENDS IN PCB CONTAMINATION IN DUTCH COASTAL AND INLAND FISHERY PRODUCTS 1972-1976**, Rijksinstituut voor Visserijonderzoek, Ymuiden (Netherlands). P. Hagel, and L. G. M. Th. Tuinstra. Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 671-676, 1978. 1 fig, 1 tab, 4 ref.

Descriptors: \*Polychlorinated biphenyls, \*Pesticide residues, \*Chlorinated hydrocarbon pesticides, \*Fish physiology, Path of pollutants, Residues, Pesticides, Pesticide kinetics, Animal metabolism, Eels, Pikes, Mussels, Gas chromatography, \*Tissue analysis.

Samples of the edible parts of sole, pike-perch, eel, and mussel were collected over the period from January 1972 to December 1976. No significant changes over time of PCB content were detected by gas chromatography analysis. All fish contained PCB concentrations on the order of 20 ppm on a fat base. (EIS-Deal) W78-10546

**A COMPARISON OF HYDROCARBONS IN ANIMALS AND THEIR BENTHIC HABITATS**, Woods Hole Oceanographic Institution, MA. J. M. Teal, and J. W. Farrington. Rapports et Proces-Verbeaux des Reunions, Conseil International pour l'Exploration de la Mer, Vol. 171, p 79-83, 1977. 2 fig, 3 tab, 8 ref.

Descriptors: \*Absorption, \*Estuarine environment, \*Marshes, \*Benthic fauna, \*Oil spills, \*Oil, \*Path of pollutants, \*Adsorption, \*Sediments, \*Mussels, Habitats, Benthos, Metabolism, Animal physiology, Organic compounds, Bottom sampling, Intertidal areas, Environmental effects, Minnows, Shellfish, Invertebrates, \*Fundulus.

Studies in several estuarine and marsh areas have shown significant differences between the composition of petroleum hydrocarbons in benthic animals and their habitat. When subjected to an oil spill some animals take up a mixture of petroleum hydrocarbons with a composition similar to that of the spilled oil found in the substratum. Others develop the ability to metabolize or otherwise modify their hydrocarbon content possibly by selective uptake such that it approaches the pre-spill conditions. When sediments are pulsed with petroleum hydrocarbons from an oil spill, degradation occurs at rates which are significantly different for different classes of compounds. Some classes persist for more than five years in significantly elevated concentrations. In contrast, biogenic hydrocarbons in relatively unpolluted sediments seem to be subjected to little degradation over 10 to 50 year periods after deposition. (EIS-Katz) W78-10550

**DDE AND PCBs IN EGGS OF NORWEGIAN SEABIRDS**, Tromsø Univ., (Norway). Inst. of Biology and Geology. N. Fimreite, J. E. Bjerk, N. Kveseth, and E. Brun. Astarte, Vol. 10, 1977, p. 15-20, 1 tab, 1 fig, 24 ref.

Descriptors: \*Aroclor, \*Polychlorinated biphenyls, DDE, \*DDT, \*Bird eggs, Birds, \*Gulls, On-site investigation, Animal pathology, Animal physiology, Reproduction, Chemical analysis, Water birds, Gannets, Razorbills, Guillemot, Kittiwake, Norway, Sata bassana, Larns argentus, Alco torda, Uria aalge, Rissa tridactyla.

Concentrations of DDE and polychlorinated biphenyls (PCBs) were measured in 203 seabird eggs collected from 10 localities along the coast of



Norway (58 deg 57'N - 71 deg 05'N). The average concentrations of DDE were, on a wet weight basis, 2.05, 1.57, 1.20, 0.80 and 0.37 ppm in eggs of Gannet, Herring gull, Razorbill, Guillemot and Kittiwake, respectively. The corresponding concentrations of PCBs were 7.71, 8.49, 5.40, 2.19, and 2.87 ppm. Some geographical variation was found, but no south-north gradient. The possible biological effects are discussed. (EIS-Katz) W78-10553

**REPRODUCTIVE PARAMETERS AND EGG CONTAMINANT LEVELS OF GREAT LAKES HERRING GULLS.**  
Canadian Wildlife Service, Ottawa (Ontario).  
Toxic Chemical Section.  
A. P. Gilman, G. A. Gox, D. B. Peakall, S. M. Teeple, and T. R. Carroll.  
Journal of Wildlife Management Vol. 41(3), 1977. p 458-468, 5 tab, 2 fig, 35 ref.

Descriptors: \*Gulls, \*Eggs, \*Chlorinated hydrocarbon insecticides, Great Lakes, \*Lake Ontario, Reproduction, Water pollution effects, Path of pollutants, \*DDT, DDE, DDD, Dieldrin, Mercury, \*Polychlorinated biphenyl, Heptachlor epoxide, \*Mirex, Hexachlorobenzene, Herring gull.

Poor reproductive success and declines in colony size of herring gulls (*Larus argentatus*) have occurred in Lake Ontario at a time that dramatic increases of this species have been reported on the Atlantic seaboard. In 1975 herring gull productivity on Scotch Bonnet Island, Lake Ontario, was 0.15 chicks per pair of adults, one-tenth the productivity of colonies studied on Lake Erie, Huron and Superior. Reduced nest site defense and decreases in eggs found, egg hatchability and chick survival were observed in the Lake Ontario colony. The major causes of egg failure were disappearance and embryonic death. Hatching success of Lake Ontario eggs by artificial incubation was 23-26 percent compared to 53-79 percent for eggs from other areas. Analyses of eggs from 9 gull colonies for organochlorine contaminants indicated that the pattern of relative contamination was: Lake Ontario > Michigan > Superior > Huron > Erie. Mirex levels were nearly 10 times higher in Lake Ontario than in the other lakes. Movements of herring gulls within the Great Lakes basin are offered as an explanation of variation in individual egg residues in each colony and the moderately high levels of chemical residues in some Lake Superior eggs. (EIS-Katz) W78-10556

**RETENTION OF SMALL PARTICLES BY THE GILLS OF THE JAPANESE OYSTER (IN JAPANESE).**  
Hiroshima Prefecture Fisheries Experiments Station, Ondo (Japan).  
Y. Kusuki.  
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43(12), 1977, p 1391-1396, 4 tab, 17 ref. (English summary).

Descriptors: \*Oysters, Commercial shellfish, \*Sediments, Animal behavior, Sediment distribution, \*Algae, Filters, Sea water, \*Filtration, Phytoplankton, Suspended solids, \*Particle size, Laboratory test, Hiroshima Bay, \*Japanese oyster.

Efficiency of the retention of small particles by the gills of the Japanese oyster was investigated. From the results thus obtained and measurements of the size distribution of particulate material suspended in sea water, estimation of the quantity of particulate matter as food for oysters was also discussed. Particle filtration by the oyster was studied in the 1.5 to 6.0  $\mu$  size range in relation to naturally occurring particles. The oyster usually retained particles larger than 3  $\mu$ , but could retain particles of sizes down to 2.0  $\mu$  or smaller, when larger particles became scarce. There was a sharp

increase in removal efficiency as particle size increased from 1.5 to 3.0  $\mu$ . Larger sizes showed no evidence of further change in efficiency. The particulate matter in Hiroshima Bay consisted mainly of particles smaller than 40 microns in diameter and this portion accounted for more than 90% (dry basis) of all particulate matter. (EIS-Katz) W78-10560

**EFFECTS OF MARBLE CUTTING AND POLISHING INDUSTRIES WASTEWATER DISPOSAL (WESTERN SICILIAN COAST) ON THE PHITOBENTHOS COMMUNITIES AND ON THE YIELD OF TUNA FISHING WITH TUNA FISHING TRAPS (IN ITALIAN).**  
For primary bibliographic entry see Field 5C.  
W78-10564

**DISTRIBUTION OF MACROBENTHIC SPECIES IN LAKE ONTARIO IN RELATION TO SOURCES OF POLLUTION AND SEDIMENT PARAMETERS.**  
National Field Investigations Center-Cincinnati, OH.  
For primary bibliographic entry see Field 5C.  
W78-10569

**CHANGE IN FISH TOXICITY OF LAS DURING BIODEGRADATION, (IN JAPANESE).**  
Lion Fat and Oil Co. Ltd., Tokyo (Japan)  
For primary bibliographic entry see Field 5C.  
W78-10571

**MONITORING OF THE ACCUMULATION OF ORGANO CHLORINES IN FISH (UBERWACHUNG DER SPEICHERUNG VON CHLORIERTEN KOHLENWASSERSTOFFEN IM FISCH).**  
Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnen-fischerei.  
E. Huschenbeth.  
Archiv fur Fischerei Wissenschaft, Vol 28, (2/3), 1977, p 173-186, 9 tab, 8 ref.

Descriptors: \*Chlorine hydrocarbon pesticides, \*Commercial fish, Commercial fisheries, \*Monitoring, Herring, Eels, DDT, Dieldrin, Endrin, Aldrin, Commercial shellfish, Crustaceans, Mollusks, Polychlorinated biphenyls, Heptachlor, Hexachlor, \*North Sea, \*Baltic, Chlordane, Methoxychlor, Hexachlorobenzene, Heptachloroepoxide, Caviar.

Analysis were carried out on 762 fishes, crustaceans and bivalves in 1973-1976 to determine the accumulation of pesticides (DDT and metabolites, Lindane and Dieldrin). Further, some cod livers and gonads of Cod and herring were investigated concerning Hexachlorobenzene, Heptachlor, Heptachloroepoxide, Aldrin, Endrin, a-Hexachlorocyclohexane, Methoxychlor, a- and B-Chlordane. As compared with earlier investigations, conducted from 1970 to 1972, all lean fish analyzed of the North-Atlantic, the North-Sea and the Baltic disclosed values below 0.1  $\mu$ g/g total DDT in the fillet. The concentrations in fat fish are several times higher, but seldom exceed the value of 1.0  $\mu$ g/g. A declining trend derives from these investigations. The PCB-values of the North-Sea and the Baltic once more amounted up to 0.2  $\mu$ g/g in lean fish, in fat fish of the North-Sea up to 0.5  $\mu$ g/g and of the Baltic up to 0.8  $\mu$ g/g. (EIS-Katz) W78-10572

**ISOLATION OF XENOBIOTIC CHEMICALS FROM TISSUE SAMPLES BY GEL PERMEATION CHROMATOGRAPHY.**  
Environmental Research Lab.-Duluth, MN.  
For primary bibliographic entry see Field 5A.  
W78-10578

**STUDIES ON THE BIOMASS DISTRIBUTION OF AQUATIC MASSES IN THE SELF PURIFYING SECTION OF A BREWERY-WASTE-WATER-POLLUTED STREAM, UNTERSUCHUNGEN ZUR BIOMASSENVERTEILUNG SUBMERSE BRYOPHYTEN IN DER SELBSTREINIGUNGSSTRECKE EINES BRAUEREIABWASSERVORFLUTERS (METTMA, HOCHSCHWARZWALD).**  
For primary bibliographic entry see Field 5C.  
W78-10579

**THE BACTERIAL PATHOGEN FLEXIBACTER COLUMNARIS AND ITS EPIZOOTIOLOGY AMONG COLUMBIA RIVER FISH, A REVIEW AND SYNTHESIS.**  
Battelle Pacific Northwest Labs., Richland, WA.  
For primary bibliographic entry see Field 5C.  
W78-10585

**PREDICTING PHOSPHATE MOVEMENT THROUGH SOIL COLUMNS.**  
Connecticut Agricultural Experiment Station, New Haven.  
B. L. Sawhney.  
Journal of Environmental Quality, Vol. 6, No. 1, p 86-89, January-March 1977. 5 fig, 21 ref.

Descriptors: Groundwater, Phosphorus, Soils, Soil investigations, Soil properties, Waste water, Sorption, \*Phosphates, \*Path of pollutants, Water pollution sources, \*Forecasting.

To assess the potential pollution of ground water with P from septic tank drainfields, sorption capacities of various soils were determined over an extended period of time and related to P movement through soil columns using solutions having P concentrations similar to waste waters. The amounts of P sorbed by fine sandy loam (fs) and silt loam (sl) soil columns before breakthrough occurred were approximately equal to the sorption capacities determined from isotherms obtained over a sufficiently long reaction time of about 200 hours. In Merrimac fs, breakthrough occurred after about 50 pore volumes of waste water had passed through the column while about 100 pore volumes passed through Buxton sl before the breakthrough occurred. Following breakthrough, concentration of P in the effluent continued to increase and approached the influent concentration after several hundred pore volumes of effluent had passed through the columns. The results suggest that while most deep soils should effectively remove P from waste water, ground water under drainfields installed in soils of low P sorption capacity after prolonged use may contain undesirably large concentrations of P. (Skogerboe Colorado State) W78-10589

**LYSIMETER MEASUREMENTS OF NITRATE AND CHLORIDE LOSSES FROM SOIL UNDER CONVENTIONAL AND NO-TILLAGE CORN, Kentucky Univ., Lexington Dept. Agronomy.**  
D. D. Tyler, and G. W. Thomas.  
Journal of Environmental Quality, Vol 6, No 1, p 63-66, January-March 1977. 6 fig, 15 ref.

Descriptors: \*Lysimeters, \*Nitrates, \*Chlorides, \*Corn(Field), Soils, Soil investigations, \*Soil water movement, Salts, \*Leaching, Nitrogen, \*Mulching, Measurement.

Soil and water movement was studied using steel pan lysimeters in the field under corn grown in killed sod and with conventional tillage. The study was done to determine the actual leaching losses of nitrogen under the two tillage systems. Losses of nitrate nitrogen and chloride used as a tracer of nitrate ion were higher under the no-tillage system as measured in the leachate collected after rainfall. This loss could occur within 1 to 2 months after the application of the nitrogen. Concentrations of nitrate and chloride ions in the leachate indicated

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5B—Sources Of Pollution

that these mobile, surface-applied anions could be washed into natural soil cracks and channels and flow much deeper into the soil than predicted by miscible displacement theory. (Skogerboe-Colorado State)  
W78-10590

**A STEADY-STATE CONCEPTUAL NITROGEN MODEL FOR ESTIMATING NITROGEN EMISSIONS FROM CROPPED LANDS,**  
Joint FAO/IAEA Div. of Atomic Energy in Agriculture, Vienna (Austria).  
K. K. Tanji, M. Fried, and R. M. Van De Pol.  
Journal of Environmental Quality, Vol. 6, No. 2, p 155-159, April-June 1977. 2 fig, 5 tab, 5 ref, 1 append.

Descriptors: \*Nitrogen, Model studies, \*Leaching, Corn(Fields), \*Crop production, \*Fertilizers, Fertilization.

Details of a conceptual nitrogen model are presented. The model is based upon the principles of mass balance and steady state. It considers both water and N flows into and out of the crop root zone. Illustrative computations are given for estimating steady-state N leaching losses from two cornfield sites and comparisons are made with measured values. This model may be applied to other crops or cropping practices. (Skogerboe-Colorado State)  
W78-10601

**A LABORATORY STUDY ON THE ROLE OF STREAM SEDIMENT IN NITROGEN LOSS FROM WATER,**  
Guelph Univ. (Ontario). Dept. of Environmental Biology.  
P. Sain, J. B. Robinson, W. N. Stammers, N. K. Kaushik, and H. R. Whiteley.  
Journal of Environmental Quality, Vol. 6, No. 3, p 274-278, July-September 1977. 4 fig, 4 tab, 14 ref.

Descriptors: \*Laboratory tests, \*Sediments, Denitrification, \*Nitrogen, Nitrates, \*Denitrification, Temperature, Water quality, Streams.

Laboratory experiments were conducted on samples of sediment collected from a stream having an appreciable input of nitrate at its source. Earlier work had shown that the water lost much of the nitrate as it moved downstream, presumably by denitrification. Columns of sediment were reconstituted in plexiglass tubes, overlain with water containing nitrate, and incubated at 10, 15, or 22°C. The water was aerated with a helium-oxygen mixture. Nitrate concentration decreased rapidly but the rate varied with temperature and depth of sediment. At 22°C, in water overlying 10-cm columns of sediment, over 90% of the nitrate was removed in 3 weeks from a solution originally containing 10 mg/liter nitrate-N. Nitrate disappeared less rapidly at lower temperatures and when sediment columns were <5 cm deep. In columns <5 cm deep and at low temperatures nitrate diffused to the bottom of the columns, while columns 5 cm deep or more were effectively of infinite depth. Because of the interdependence of diffusion from the liquid phase into the sediment and denitrification, it is not possible to inter kinetics of denitrification in these columns proceeded at a rate compatible with observations made previously in the stream from which the sediment originated. (Skogerboe-Colorado State)  
W78-10602

**PARTITIONING AND TRANSPORT OF LEAD IN LAKE WASHINGTON,**  
Duke Univ., Beaufort, NC. Marine Lab.  
R. W. Baier, and M. L. Healy.  
Journal of Environmental Quality, Vol. 6, No. 3, p 291-296, July-September 1977. 9 fig, 3 tab, 13 ref.

Descriptors: \*Lead, Runoff, Sediments, Sedimentation, \*Model studies, Adsorption, Absorption,

Limnology, \*Path of pollutants, Water pollution sources, Lake Washington(Wash), \*Lake sediments.

Input of lead to Lake Washington appears to result from the settling of airborne Pb onto surface waters and the washing of terrestrial accumulations to the lake as runoff. Some of the Pb received by the lake is associated with particles that sink, while the remainder leaves the lake with the overflow. The range in Pb concentration during 2 years of sampling was 0.04 to 6.6 ppb. The path of Pb to the sediments is not direct but involves cycling through both liquid and solid phases. Over 70% of the total Pb entering the lake is retained by sediment. Lead in top layers of sediment ranged from 242 ppm near a heavily used bridge to 4 ppm near the major tributary of the lake. A simple compartment model accounts for some of the interchanges between dissolved and particulate forms of Pb through the processes of adsorption, absorption, and complexation. The time required to achieve steady-state conditions for the model is comparable to the yearly flushing period. Large shifts in the annual timing of flushing and mixing are encountered because of meteorological changes. (Skogerboe-Colorado State)  
W78-10603

**NONLINEAR DIFFUSION APPLIED TO GROUNDWATER CONTAMINATION PROBLEMS,**  
Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering.  
P. Basak, and V. V. N. Murty.  
Journal of Hydrology, Vol. 35, No. 3/4, p 357-363, November 1977. 5 fig, 5 ref, 1 append.

Descriptors: Mathematical studies, \*Diffusion, Groundwater, Groundwater movement, \*Groundwater resources, Aquifers, Water quality, \*Water pollution sources, \*Path of pollutants.

An analytical solution to the problem of concentration dependent diffusion with increasing concentration at the source is presented. The solution is of traveling wave type and is applied to predict the contamination in an aquifer from a source wherein the contamination concentration is increasing with time. (Skogerboe-Colorado State)  
W78-10606

**HYDROLOGIC MONITORING OF A DEEPWELL-INJECTION SYSTEM NEAR PENSACOLA, FLORIDA, MARCH 1970-MARCH 1977,**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
C. A. Pascale, and J. B. Martin.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 086. Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 78-27, March 1978. 61 p, 5 fig, 4 tab, 17 ref.

Descriptors: \*Injection wells, \*Industrial wastes, \*Path of pollutants, \*Groundwater movement, \*Observation wells, Water quality, Monitoring, Chemical analysis, Aquifer characteristics, Confined water, Pressure head, Deep wells, \*Florida, \*Pensacola area(Fla).

This report presents hydraulic and chemical data collected at a deep-well waste-injection system near Pensacola, Florida. Since injection began in July 1963, about 13.3 billion gallons of industrial acidic waste containing nitric acid, inorganic salts and numerous organic compounds have been injected into a saline-water-filled limestone aquifer. Wellhead pressure at two injection wells averaged 180 pounds per square inch in March 1977 and the hydraulic pressure gradient was 0.53 pound per square inch per foot of depth to the top of the injection zone. Increases in pressure since 1970 at two wells used to monitor the injection zone at

sites located 1.9 miles north and 1.5 miles south of the injection site have been about 22 and 29 pounds per square inch. The pressure in a shallow monitor well, penetrating the first permeable zone above the 220-foot-thick confining bed, declined about 4 pounds per square inch. No changes were detected in the chemical character of water from the shallow monitor well and the north monitor well, but since late 1973, concentrations of bicarbonate and dissolved organic carbon in water from the south monitor well have increased. (Woodard-USGS)  
W78-10625

**TRANSPORT AND DISPERSION OF FLUORESCENT TRACER PARTICLES FOR THE DUNE-BED CONDITION, ATRISCO FEEDER CANAL NEAR BERNALILLO, NEW MEXICO,**  
Geological Survey, Bay Saint Louis. MS. Water Resources Div.; and Geological Survey, Menlo Park, CA. Water Resources Div.  
For primary bibliographic entry see Field 2J.  
W78-10634

**GROUND-WATER POLLUTION BY NITROGEN COMPOUNDS AT OLEAN, NEW YORK-PROGRESS REPORT, JUNE 1977,**  
Geological Survey, Albany, NY. Water Resources Div.  
A. D. Randall.  
Open-file report 78-304, March 1978. 11 p, 4 fig, 6 ref.

Descriptors: \*Water pollution control, \*Groundwater, \*Nitrogen compounds, \*Pumping, \*Water wells, Groundwater movement, Aquifer characteristics, Drawdown, Artificial recharge, Water spreading, Leaching, Planning, New York, \*Olean.

Ground water in an area in Olean, New York contains high concentrations of nitrogen compounds, which are being slowly flushed from the aquifer as the ground water flows toward a nearby well field where it is pumped out. Construction and regular use of a new production well in the area of nitrogen-rich water would temporarily increase the rate of nitrogen removal by causing more rapid flow of water from the silty upper part of the aquifer downward to the more permeable lower part, and by reducing the distance the water must flow through the lower part to the nearest point of withdrawal. After such a well had been in use for several months and the system had adjusted to the new conditions, the rate of further nitrogen removal would depend on the rate at which nitrogen compounds are leached from the soil by infiltrating precipitation. Alternative techniques for speeding the flushing of the aquifer include artificially increasing the amount of infiltration, changing the rates of withdrawal from existing production wells, and pumping shallow low-yield wells in the area of nitrogen-rich water. (Woodard-USGS)  
W78-10649

**REAL-TIME CONTROL OF WATER QUALITY AND QUANTITY,**  
International Inst. for Applied Systems Analysis, Laxenburg (Austria).  
For primary bibliographic entry see Field 5G.  
W78-10657

**A PARTITIONING PROCEDURE FOR WATER QUALITY MANAGEMENT MODELS,**  
Environmental Protection Agency, Cincinnati, OH.  
For primary bibliographic entry see Field 5G.  
W78-10660

**WATER QUALITY OF NORMAL AND STORM-INDUCED SURFACE WATER RUNOFF:**

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J.R. Schubel  
Special Rep  
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New York,  
1977. 72 p, 22

Descriptors:  
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**KANE'ŌHE BAY WATERSHED OAHU, HAWAII FEBRUARY 1974 TO MARCH 1975,**  
Hawaii Univ., Honolulu.  
For primary bibliographic entry see Field 5C.  
W78-10665

**SUSPENDED SEDIMENT IN THE CHESAPEAKE AND DELAWARE CANAL,**  
State Univ. of New York at Stony Brook. Marine Sciences Research Center.  
J. R. Schubel, A. D. Williams, and W. M. Wise.  
Special Report 11, Reference 77-7, Marine Sciences Research Center State University of New York, Stony Brook, New York, October 1977. 72 p, 22 fig, 8 tab, 39 ref, 1 append.

Descriptors: \*Water quality, Effects, \*Salinity, \*Sediments, \*Temperature, \*Canals, Fish eggs, Larvae, Regional analysis, Chesapeake Bay, Delaware River, Canal routes, Dredging, Mortality.

From March 1971 through February 1972, samples of suspended sediment at a series of stations along the axis of the Chesapeake and Delaware Canal were collected. On each cruise, several stations were also occupied in the approaches to the Canal in the Chesapeake Bay and the Delaware Bay. The collection program was accomplished in conjunction with studies by Pritchard and Gardner (1974). This report reviews briefly the dredging history of the Chesapeake and Delaware Canal, summarizes the suspended sediments observations in tabular and graphical form, and assesses the biological implications of the observed suspended sediment distribution patterns. (Bell-Cornell)  
W78-10666

**FINAL REPORT, ENVIRONMENTAL IMPACT MODEL DEVELOPMENT FOR NAVAL OPERATIONS,**  
Naval Weapons Center, China Lake, CA. Public Works Dept.  
For primary bibliographic entry see Field 6G.  
W78-10667

**QUALITY OF THERMOMECHANICAL PULPING EFFLUENTS,**  
MacMillan Bloedel Ltd., Powell River (British Columbia).  
G. W. Holmes.

Canadian Forestry Service Ottawa, Ontario K1A 0H3. Cooperative Pollution Abatement Research (CPAR) Project Report 303-2, Final report to March 31, 1976. 21 p, 2 append. 1 fig, 5 tab.

Descriptors: \*Pulp wastes, \*Thermomechanical pulp mills, \*Water quality, Effluents, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Recycling, Softwood, Hemlock trees, Biochemical oxygen demand, Toxicity, Hydrogen ion concentration, Conductivity, Canada, Water reuse, Carbon, White water (Paper machines), Spruce trees (Picea), Mechanical pulp mills, Groundwood mills.

At the Powell river division of MacMillan Bloedel Ltd. (British Columbia), no appreciable differences were observed between thermomechanical pulp (TMP) and ordinary groundwood in effluent volumes or ecological quality of discharges. Factors of major impact in either case were the wood species used and the recycling of white water. Among two softwoods, western spruce produced twice as much BOD, total organic carbon, and toxicity as did western hemlock. Although effluent toxicity did not increase when white water was passed through the direct-contact heat-recovery unit of the TMP plant, recycling did cause unexpected changes in pH, conductance, and BOD. Recycled pulp-mill white water is about twice as rich in environmentally deleterious material as is excess paper-machine white water. Chemical pretreatments of pulpmill chips and other TMP process variations could cause greater differences. (Brown-IPC)

W78-10677

**ORIGIN AND REMOVAL OF PRECIPITATED SUSPENDED SOLIDS IN BLEACHED KRAFT PULP MILL EFFLUENTS,**  
British Columbia Forest Products Ltd., Mackenzie.  
For primary bibliographic entry see Field 5D.  
W78-10678

**MIXING EFFECTS DUE TO BOATING ACTIVITIES IN SHALLOW LAKES,**  
Florida Technological Univ., Orlando. Dept. of Civil Engineering and Environmental Science.  
Y. A. Yousef, W. M. McLellan, R. H. Fagan, H. H. Zebuth, and C. R. Larrabee.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 493, Price codes: A20 in paper copy, A01 in microfiche. Environmental Systems Engineering Institute, Technical Report ESEI No. 78-10, June 1978. 352 p, 46 fig, 58 tab, 130 ref, 7 append. OWRT C-7020(6203)(1).

Descriptors: Waves, Recreational boats, \*Mixing effects, Lake management, Water quality, \*Sediment resuspension, \*Turbidity, Water pollution sources, \*Algal identification, \*Chlorophyll analysis, \*Phosphorus content, \*Bioassay, Pollutant identification.

Recreational boats equipped with engines varying from 28 to 165 horsepower were used for agitation on Lakes Claire, Mizell, and Jessup in Central Florida. Primary and secondary waves generated by motorboats at the water-sediment interface were recorded. When boat velocities were greater than the square root of the acceleration of gravity and water depth, the average primary wave amplitudes decreased exponentially with depth. An empirical relationship between average wave amplitude, engine horsepower and the water depth was developed. Scour velocities for sediment particles from known wave amplitudes were calculated and verified. Mixing by motorboats in the lakes resuspended bottom sediments and increased turbidity. The increase in turbidity was accompanied by an increase in the phosphorus content, chlorophyll a, and respiration rates within the waterbody. Also, a reduction in the dissolved oxygen content may result.  
W78-10734

**ON THE BENTHIC FAUNA OF SOME RIVER SYSTEMS IN THE NAGASAKI DISTRICT (1) THE SASU AND THE SE RIVERS OF TSUSHIMA IN WINTER (IN JAPANESE),**  
Nagasaki Inst. of Health Science and Environmental Science (Japan).  
For primary bibliographic entry see Field 5C.  
W78-10736

**POLYCHLORINATED 2-AMINODIPHENYL ETHERS IN FISH,**  
Karolinska Inst., Stockholm (Sweden). Dept. of Chemistry.  
For primary bibliographic entry see Field 5C.  
W78-10737

**CADMIUM IN PORT PHILLIP BAY MUSSELS,**  
La Trobe Univ., Bundoora (Australia) Dept. of Inorganic and Analytical Chemistry.  
V. W. Talbot, R. J. Magee, and M. Hussain.  
Marine Pollution Bulletin, Vol 7, No 5, p. 84-86, 1976. 1 fig, 3 tab, 2 ref.

Descriptors: \*Australia, \*Metals, \*Cadmium, \*Mollusks, \*Mussels, \*Oysters, Water pollution effects, Sediments, Estuaries, Path of pollutants, Melbourne (Australia), \*Port Phillip Bay, Corio Bay, Mytilus edulis, Tissue content.

Port Phillip Bay receives the industrial and domestic effluents from Melbourne and a recent survey revealed an accumulation of a variety of heavy metals in bottom sediments. These studies have now been extended to survey the accumulation in oysters and mussels, and in most areas in the Bay these bivalves are heavily contaminated with cadmium. Oysters accumulate more of this metal than mussels. (Katz-EIS)  
W78-10743

**BENTHIC MOLLUSCAN ASSEMBLAGES IN RELATION TO SEDIMENT GRADIENTS IN NORTHEASTERN LONG ISLAND SOUND, CONNECTICUT,**  
City Univ. of New York. Inst. of Oceanography.  
D. Franz.  
Malacologia Vol 15, No 2, p 377-399, 1976. 6 fig, 32 ref, 4 app.

Descriptors: \*Molluscs, \*Benthos, \*Benthic fauna, Animal populations, \*Connecticut, Sediment distribution, \*Sediments, Environmental gradient, Statistical analysis, \*Long Island Sound, \*Fishers Island Sound, Sediment particle size, Sands, Environmental effects.

Factors accounting for high dominance and low evenness in very fine sediments are discussed, and it is argued that this reflects the homogeneity of the energy resource (organic matter), the reduced pool of potential competitors, and the severely seasonal thermal environment. Sediment-correlated species associations in this area appear to be fairly stable and predictable within a framework of seasonal variability in the degree of dominance exhibited by certain species. The Classification procedure is useful in grouping stations along a gradual environmental procedure is useful in grouping stations along a gradual environmental continuum for the purpose of diversity analysis. It is not argued that these groups comprise rigid, non-overlapping associations or communities. (Katz-EIS)  
W78-10747

**THE ACCUMULATION OF RADIOACTIVE CAESIUM FROM WATER BY THE BROWN TROUT (SALMO TRUTTA) AND ITS COMPARISON WITH PLAICE AND RAYS,**  
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.  
C. J. Hewett, and D. F. Jeffries.  
Journal of Fish Biology, Vol 9, No 6, p 479-489, 1976. 2 fig, 7 tab, 24 ref.

Descriptors: \*Brown trout, \*Radioactivity, \*Metals, Freshwater fish, Marine fish, Fish physiology, Path of pollutants, Water pollution effects, Radioisotopes, Radioactivity techniques, \*Radioactive Caesium, Benthic fish, \*Marine flatfish, \*Plaice, Rays, Fish blood, Erythrocytes.

The patterns of accumulation of caesium-137 from water by the tissues and organs of the freshwater teleost, the brown trout (*Salmo trutta*) are described. Estimates of the biological half-times and steady-state concentrations are derived, using a simple exponential equation. In all tissues and organs examined, other than muscle, the rate processes of the trout fall between those of the plaice and the ray. Most of the caesium accumulated by the brown trout from water enters other than by the gut, probably through the gills, but as with plaice and ray, the main source of the caesium, possibly 90%, must come from the food. Despite differences in the levels of accumulation, the ratios of the tissue to blood steady state concentrations are very similar in all three species. The steady state caesium concentration of the blood appears to be directly related to the red blood cell count of the fish. (Katz-EIS)  
W78-10749



## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5B—Sources Of Pollution

#### WATER QUALITY COMPARISON STUDY, ESCAMBIA RIVER AND OTHER NORTHWEST FLORIDA STREAMS.

Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.  
For primary bibliographic entry see Field 5A.  
W78-10759

#### CARELESS KEPONE,

Hofstra Univ., Hempstead, NY. Dept. of Chemistry.  
For primary bibliographic entry see Field 5G.  
W78-10788

#### EFFECTS OF TRACE CONTAMINANTS FROM COAL COMBUSTION.

Department of Energy, Washington, DC. Div. of Biomedical and Environmental Research.  
Available from the National Technical Information Service, Springfield, VA 22161 as ERDA 77-64. Price codes: A05 in paper copy, A01 in microfiche. Proceedings of a Workshop held August 2-6, 1976, Knoxville, Tennessee, Report ERDA 77-64, June 1977. 84 p, 1 fig, 6 tab, 130 ref. R.I. Van Hook and W.D. Shults, editors.

Descriptors: \*Coals, \*Air pollution, \*Water pollution, \*Effects, Water pollution effects, Air pollution effects, Water pollution sources, Powerplants, Trace elements, Public health, Environmental effects, Pollutants, Surveys, Sampling, Coal combustion, Trace contaminants.

In August 1976, 60 experts of diverse disciplines worked together for threeplus days on a common topic: Trace Contaminants from Coal Combustion Technology. The concern was with health and ecological effects of trace contaminants that are produced and may be released by large-scale combustion of coal. Accordingly, the participants were grouped into four Panels or 'centers of interest' for working purposes: Characterization and Analysis, Environmental Transport, Ecological Effects, and Health Effects. Each Panel considered the current state of knowledge and capability with respect to trace contaminants from coal combustion and developed recommendations for future research needed to assure acceptably safe implementation of coal combustion technology on the very large scale that is anticipated. The four chapters in this document comprise the reports of each of the four Panels. There was consensus recognition of the important and considerable work that has been done already in the area of trace contaminants associated with coal combustion. Much information is available, but much more and different types of information is needed. There was general agreement that physical and chemical characterization of materials are vital prerequisites to the study of health and ecological effects. It is the chemical/physical state of trace contaminant that determines the biological availability and effect. Thus, one central recommendation is for the development of methodology and of data banks that provide information about contaminant species, as opposed to total contaminant concentration. Information about compound types, oxidation states, complexation, and organometallic moieties is generally lacking. Acquisition of such data is extremely difficult and not generally amenable to routine operations. Research into methodology is warranted. Concurrently, improved and expanded information about vapor/particulate relationships is needed, particularly with respect to the sources themselves. (Sims-ISWS)  
W78-10926

#### RADIATIVE TRANSFER MODEL FOR REMOTE SENSING OF SUSPENDED SEDIMENTS IN WATER.

MITRE Corp., McLean, VA. METREK Div.  
For primary bibliographic entry see Field 2J.  
W78-10930

#### PRELIMINARY STUDY OF SEDIMENT SOURCES IN THE POTOMAC RIVER BASIN, WASHINGTON, D.C., METROPOLITAN AREA.

Environmental Protection Agency, Washington, DC. Surveillance Branch.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 439. Price codes: A02 in paper copy, A01 in microfiche. Report, May 1970. 10 p, 2 fig, 4 tab, 7 ref.

Descriptors: \*Sediments, \*District of Columbia, \*Potomac River, \*Water pollution sources, Surveys, Monitoring, Sampling, Photography, Discharge (Water), Erosion, Urbanization, Cities, Suspended solids, Rainfall, Precipitation (Atmospheric), Watersheds (Basins), Pollutants, Path of pollutants, \*Sediment sources.

Recognizing the need for factual information on sedimentation, the Assistant Secretary of Interior, Water Quality and Research requested that the Federal Water Quality Administration, Middle Atlantic Region, conduct a sediment investigation in the Potomac River Basin between Great Falls and Hallowing Point. The investigation was designed to provide answers to the following questions: What are the sources of the sediment in the Potomac River Basin in the Washington Metropolitan area. What are the relative magnitudes of the sediment loads contributed to the Potomac River and its tributaries below Great Falls from these sources. This report summarized the results of an investigation made by the Surveillance Branch to answer the above questions. It was found that the primary sources of sediment in the Washington Metropolitan area are residential, institutional and highway construction sites, sand and gravel mining operations, and extreme erosion caused by intense runoff from parking areas, man-made stream channels, and storm sewers. Urban and suburban development are known to affect significantly sediment loads in the Potomac River Basin. Suburban areas in all parts of the Washington, D.C. area are growing at a remarkable rate. (Sims-ISWS)  
W78-10932

#### A THREE-DIMENSIONAL NUMERICAL MODEL FOR PREDICTING POLLUTANT AND SEDIMENT TRANSPORT USING AN EULERIAN-LAGRANGIAN MARKER PARTICLE TECHNIQUE.

Rhode Island Univ., Kingston. Dept. of Ocean Engineering.  
D. L. Pavish, and M. L. Spaulding.  
Available from the National Technical Information Service, Springfield, VA 22161 as N77-30643. Price codes: A11 in paper copy, A01 in microfiche. Interim Report, July 1977. 233 p, 49 fig, 7 tab, 78 ref, 2 append. NASA NSG 1008.

Descriptors: \*Sediment transport, \*Path of pollutants, \*Model studies, \*Mathematical models, Wastes, Waste disposal, Diffusion, Dispersion, Settling velocity, Particle size, Oceans, Equations, Mathematics.

A computer coded Lagrangian marker particle in Eulerian finite difference cell solution to the three dimensional incompressible mass transport equation, Water Advective Particle in Cell Technique, WAPIC, was developed, verified against analytic solutions, and subsequently applied in the prediction of long-term transport of a suspended sediment cloud resulting from an instantaneous dredge spoil release. Numerical results from WAPIC were verified against analytic solutions to the three dimensional incompressible mass transport equation for turbulent diffusion and advection of Gaussian dye releases in unbounded uniform and uniformly sheared uni-directional flow, and for steady-uniform plug channel flow. WAPIC was utilized to simulate an analytic solution for non-equilibrium sediment dropout from an initially vertically uniform particle distribution in one-dimensional turbulent channel flow. Predicted sediment fallout rates and vertical concentration values as a

function of downstream distance were within an absolute accuracy of 4% of the analytic values. (Sims-ISWS)  
W78-10933

#### SEDIMENT OXYGEN DEMAND STUDIES OF SELECTED NORTH-EASTERN ILLINOIS STREAMS,

Illinois State Water Survey, Urbana.  
For primary bibliographic entry see Field 2J.  
W78-10943

#### TEMPERATURE ANALYSIS AND SELECTIVE WITHDRAWAL DESIGN STUDY TALLAHALA CREEK LAKE, MISSISSIPPI; MATHEMATICAL MODEL INVESTIGATION,

Army Engineer Waterways Experiment Station, Vicksburg, MS.  
S. T. Maynard, B. Loftis, and D. G. Fontane.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 620. Price codes: A05 in paper copy, A01 in microfiche. Technical Report H-78-1, January 1978. 93 p, 17 pl, 1 tab, 14 ref, 3 append.

Descriptors: \*Dissolved oxygen, \*Thermal properties, \*Water temperature, Reservoirs, Outlet works, Mississippi, \*Tallahala Creek Lake (Miss), \*Selective withdrawal, Tallahala Creek, Mathematical models, Multilevel outlets.

A numerical simulation model was used to evaluate the thermal characteristics of the proposed Tallahala Creek Lake near Laurel, Mississippi. Several multilevel intake configurations were evaluated on the basis of capability of meeting a natural stream temperature objective. Each of the multilevel configurations exhibited similar performance in meeting the temperature objectives. One of the configurations was recommended because it will provide simpler operation. Additionally, a cursory analysis of anticipated dissolved oxygen content in and downstream of the lake was performed. Based on simulated oxygen profiles in the lake and potential reaeration through the Tallahala Creek Lake outlet works, it is expected that acceptable levels of dissolved oxygen will exist immediately downstream of the structure. (WES)  
W78-10946

#### THE FLORA OF DREDGED MATERIALS SITES IN NAVIGATION POOL 8 OF THE UPPER MISSISSIPPI RIVER,

Wisconsin Univ.-La Crosse.  
For primary bibliographic entry see Field 5E.  
W78-10947

#### A LABORATORY STUDY OF THE TURBIDITY GENERATION POTENTIAL OF SEDIMENTS TO BE DREDGED,

Abcor, Inc., Wilmington, MA. Walden Research Div.  
For primary bibliographic entry see Field 2J.  
W78-10951

#### AVAILABILITY OF SEDIMENT-ADSORBED SELECTED PESTICIDES TO BENTHOS WITH PARTICULAR EMPHASIS ON DEPOSIT-FEEDING INFAUNA,

LFE Environmental Analysis Labs., Richmond, CA.  
For primary bibliographic entry see Field 5C.  
W78-10955

#### AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON; APPENDIX E: RELEASE AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS INDUCED

BY OPEN-WATERS, Washington University, S. P. Pavlou, I. Hafferty, Army Engineer Vicksburg, MS. January 1978. pend.

Descriptors: investigation, material, Duwamish, Path of pollutants.

A detailed di-ducted to ev-biphenyls (P-contaminant Puget Sound provided co-tation of the material to disposal of wamish Riv-temporal tro-and its imm-the depend-water, susp-sediments (appropri-which might characteris-disposed m-in the dist-impact zon-conditions W78-10962

OIL POLLU-Oil Polluti-T. Dixon. Marine P-1975, p 70

Descriptors-wastes, E-abatement \*Water po

While Isl-of oil po-for many-theres-are from-industry power st-ment has-Recent in-offenses-receiving-to reduc-will be c-ports and-power s-pipeline-concern-River ne-dod, Eil-keion, m-microfa-recently-link th-(Tickes-W78-10

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## Sources Of Pollution—Group 5B

**BY OPEN-WATER DREDGE DISPOSAL ACTIVITIES,**

Washington Univ., Seattle. Dept. of Oceanography.  
S. P. Pavlou, R. N. Dexter, Hom. Wilson, and A. J. Hafferty.

Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-24, January 1978. 546 p, 15 tab, 21 fig, 27 ref, 5 append.

Descriptors: \*Polychlorinated biphenyls, On-site investigations, Sediments, Washington, \*Dredged material disposal, \*Waste disposal sites, \*Duwamish waterway(Wash), \*Puget Sound, \*Path of pollutants.

A detailed discussion of the results of a study conducted to evaluate the release of polychlorinated biphenyls (PCB's) during open-water disposal of contaminated dredged material in Elliott Bay, Puget Sound, Washington. Specific information provided consists of the following: a. A documentation of the release of PCB's from the dredged material to the water column during and after disposal of contaminated sediments from the Duwamish River. b. An evaluation of the spatial and temporal trends in PCB levels at the disposal site and its immediate vicinity. c. An examination of the dependence of PCB residues measured in water, suspended particulate matter (SPM), and sediments on physical and chemical variables (appropriate to each marine phase examined) which might affect the accumulation and release characteristics of these chemicals from the disposed material. d. An assessment of the change in the distribution characteristics of PCB's in the impact zone as compared to the prevailing ambient conditions in the area prior to disposal. (WES).  
W78-10962

**OIL POLLUTION ON ISRAELI COASTS,**

Oil Pollution South East Kent, Dover (England). T. Dixon.

Marine Pollution Bulletin, Vol. 6, No. 5, May 1975, p 70-72. 3 fig, 2 tab, 4 ref.

Descriptors: \*Oil pollution, \*Oil spills, \*Industrial wastes, Environmental effects, Coasts, Pollution abatement, Water pollution control, \*Israel, \*Water pollution sources.

While Israeli coasts have experienced the effects of oil pollution from the Eastern Mediterranean for many years, a recent study now indicates that there are additional inland problems originating from industrial waterways, general cargo ports, power stations, and oil ports which the government has had problems in effectively controlling. Recent increases in fines, detentions for repeated offenses, and the availability of barges capable of receiving oil residues from shipping, are expected to reduce the problem. Additionally, oil spillage will be controlled by equipment from neighboring ports and oil terminal, and to add further controls power stations will be supplied with fuel oil by pipeline instead of tankers. The major areas of concern are the industrial waterway on the Kishon River near Haifa, the general cargo ports of Ashdod, Eilat and Haifa and oil ports at Haifa, Ashkelon, and Eilat. A general decline of marine microfauna and living corals near Eilat has recently been noticed; however, it is difficult to link these effects to any specific pollutant. (Tickes-Arizona).  
W78-10968

**ASSESSMENT OF WATER QUALITY IMPACTS OF A WESTERN COAL MINE,**

Argonne National Lab., IL. Land Reclamation Program.

For primary bibliographic entry see Field 5G.

W78-10984

**SOME APPLICATIONS OF HYDROLOGIC SIMULATION MODELS FOR DESIGN OF SURFACE MINE TOPOGRAPHY,**

Agricultural Research Service, Fort Collins, CO.

For primary bibliographic entry see Field 5G.

W78-10986

**SOIL EROSION AND ITS CONTROL IN EASTERN WOODLANDS,**

Northeastern Forest Experiment Station, Broomall, PA.

For primary bibliographic entry see Field 2J.

W78-10987

**WATER QUALITY IMPACTS OF HARVESTING AND REGENERATION PRACTICES,**

Southern Forest Experiment Station, Oxford, MS. Forest Hydrology Lab.

S. J. Ursic.

In: Proceedings '208' Symposium, Non-Point Source of Pollution from Forested Land, p. 223-232. 1977. 22 refs. Southern Illinois University Carbondale.

Descriptors: Water quality, \*Water quality standards, \*Harvesting, \*Coastal plains, \*Channel erosion, \*Clearcutting, Federal Water Pollution Control Act, \*Water pollution control, Forest management, Pollutants, Forest practices, \*Non-point source pollution, \*Sediments, Undisturbed forests, Public Law 92-500, Regeneration.

Information on water quality from undisturbed southern forest lands is summarized and the impacts of harvesting and regeneration practices on non-point source pollution discussed. An urgent need is to obtain data upon which equitable water quality standards for forest lands can be based and to formulate feasible practices to help meet water quality goals. Sediment is the major pollutant of concern. Base levels of sediment concentrations for important southern forest-land cover types are suggested. Sediment contributions from channels must be evaluated apart from those caused by forestry activities to prevent placing needless restrictions on forest lands. Short-lived changes in water quality after properly planned and executed harvesting, including clearfelling, can meet reasonable standards for sediment and chemical water quality. Sufficient information is not available to evaluate activities creating greater soil disturbances than harvesting. (Forest Service).  
W78-10996

**FATE OF HYDROCARBONS IN FISH,**

Torry Research Station, Aberdeen (Scotland).

For primary bibliographic entry see Field 5C.

W78-11000

**ON THE ORIGIN OF HYDROCARBONS IN MARINE ORGANISMS,**

Torry Research Station, Aberdeen (Scotland).

J. Murray, A. B. Thomson, A. Stagg, R. Hardy, and K. J. Whittle.

Rapports et Procès-Verbaux des Reunions, Conseil International pour l'Exploration de la Mer, Vol. 171, p 84-90, 1977. 3 fig, 3 tab, 22 ref.

Descriptors: \*Food chains, \*Absorption, \*Zooplankton, \*Algae, \*Marine algae, \*Primary productivity, \*Tracers, \*Carbon radioisotopes, \*Carbon cycle, Marine plants, Laboratory tests, Plankton, Analytical techniques, Animal physiology, Biochemistry, Carbon dioxide, Chromatography, Organic compounds, Chemical analysis, Phaeodactylum, Anabaena, \*Fatty acids, \*Endogenous hydrocarbons.

Using radiochemical techniques a study has been made of the aliphatic hydrocarbons of certain algae and also of a mixed zooplankton culture which had been allowed to graze on 14C labelled Phaeodactylum. In each case only a small number of specific compounds in the alkane array were

labelled. The much wider range of hydrocarbons found in harvested marine mixed plankton samples suggests that some of this hydrocarbon may be of exogenous origin. (EIS-Katz)  
W78-11002

**ALARMING SIGNS OF MERCURY POLLUTION IN A FRESHWATER AREA OF FINLAND,**

Helsinki Univ. (Finland). Dept. of Environmental Science.

For primary bibliographic entry see Field 5C.

W78-11003

**EFFECTS OF CADMIUM AND MERCURY ON THE BEHAVIORAL RESPONSES AND DEVELOPMENT OF EURYPANOEUS DEPRESSUS LARVAE,**

South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.

For primary bibliographic entry see Field 5C.

W78-11005

**ZINC, CADMIUM AND LEAD IN WATER, SEDIMENTS AND SUBMERGED PLANTS OF THE DERWENT RESERVOIR, NORTHERN ENGLAND,**

Durham Univ. (England). Dept. of Botany.

J. P. C. Harding, and B. A. Whitten.

Water Research, Vol. 12, p 307-316, 1978. 9 fig, 3 tab, 25 ref.

Descriptors: \*Zinc, \*Cadmium, \*Lead, \*Bottom sediments, Reservoirs, \*Copper, Nickel, Mining, On-site data collections, Reservoir silting, Sedimentation, Water chemistry, Heavy metals, Metals, Sediments, Aquatic plants, Path of pollutants, Glyceria, Nitella, \*Derwent Reservoir(England).

A partial budget is presented of the zinc, cadmium and lead entering the Derwent Reservoir. The mean levels in the water column upstream of the site of inflow are: Zn, 0.216 mg/l; Cd, 0.003 mg/l; Pb, 0.065 mg/l. The levels after passage through the 4.1 square km reservoir fall by 70.3%; 98.3% and 89.2% for Zn, Cd and Pb, respectively. Most of these metals are deposited in sediments, the mean values for which are 1035, 13 and 827 micro g/g, respectively. Lead, a higher percentage of which occurs as particulate matter, is deposited more rapidly than zinc; this effect is especially obvious when streaming of colder water along the bottom of the reservoir takes place at the time of floods. Macroscopic plants are only occasionally in this reservoir, due perhaps in part to heavy metal toxicity. Of the two most common submerged species, Nitella flexilis probably accumulates almost all of its metal content directly from the water, but the data suggest that sediments are a source of some of the heavy metals accumulated by Glyceria fluitans. (EIS-Katz)  
W78-11006

**DETERMINATION OF PCB AND PCT RESIDUES IN FISH BY TISSUE ACID HYDROLYSIS AND DESTRUCTIVE CLEAN-UP OF THE EXTRACT,**

Public Health Inst. of Slovenia Ljubljana (Yugoslavia).

For primary bibliographic entry see Field 5A.

W78-11009

**CADMIUM IN NORTHEAST PACIFIC WATERS,**

California Univ., Santa Cruz. Div. of Natural Sciences.

K. W. Bruland, G. A. Knauer, and J. H. Martin. Limnology and Oceanography, Vol. 23, No. 4, p 618-625, 1978. 4 fig, 3 tab, 14 ref.

Descriptors: \*Cadmium, \*Trace elements, \*Water quality, \*Nitrates, \*Phosphates, \*Methodology,

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5B—Sources Of Pollution

\*Oceans, Geochemistry, Nutrients, Mathematical models, Surface waters, Metals, Chemical analysis, Sea water, Water analysis, Water chemistry, Upwelling plankton.

Northeast Pacific water was collected by five different methods and the Cd in it was pre-concentrated by both chelex-ion exchange and chelation-organic extraction techniques. All sampling and preconcentration methods yielded essentially the same data. Cadmium was very significantly correlated with phosphate and nitrate at all depths and it appears that the resulting equations,  $\text{ng Cd/liter} = -3.6 + 34.9 \text{ micro mol PO}_4/\text{liter}$  and  $\text{ng Cd/liter} = 5.1 + 2.45 \text{ (micro mol NO}_3/\text{liter)}$ , can be used to predict oceanic Cd values. Cadmium concentrations are lowest in nutrient-depleted surface waters ( $4.5 \pm 0.4 \text{ ng/liter}$ ) and greatest ( $125 \text{ ng/liter}$ ) at the depths of the  $\text{PO}_4$  and  $\text{NO}_3$  maxima. Hence, Cd has one of the highest deep enrichment: surface depletion ratios (approximately 30) yet observed. Cadmium and phosphorus are also correlated in microplankton, and it is apparent that these organisms and their organic remains are a dominant factor in the biogeochemical cycling of this element. (EIS-Katz)  
W78-11011

**PASSAGE OF METALS TO FRESHWATER FISH FROM THEIR FOOD,**  
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.  
For primary bibliographic entry see Field 5C.  
W78-11012

**THE ALKANES OF MARINE ORGANISMS FROM THE UNITED KINGDOM AND SURROUNDING WATERS,**  
Torry Research Station, Aberdeen (Scotland). K. J. Whittle, P. R. Mackie, R. Hardy, A. D. McIntyre, and R. A. A. Blackman.  
Rapports et Proces-Verbaux Des Reunions, Conseil International Pour L'Exploration de la Mer, Vol. 171, p 72-78, 1977. 4 tab, 5 fig, 14 ref.

Descriptors: Pollutants, \*Organic compounds, \*Plankton, \*Path of pollutants, \*Marine fish, \*Absorption, \*Baseline studies, \*Crabs, \*Shrimp, \*Coasts, Industrial wastes, Invertebrates, Marine plants, Benthos, Commercial shellfish, Herring, Commercial fish, Distribution, Food webs, Tissue analysis, Clupea, Morone, Mytilus, Bioaccumulation.

At sites originally selected on the basis of expected hydrocarbon input, mixed plankton samples and various tissues from 11 species of invertebrates and 19 species of fish, representing some 255 samples in total, have been analysed for alkanes by capillary gas-liquid chromatography. On a comparative weight-basis, the plankton samples had the highest n-alkane values particularly at the coastal site adjacent to industrial urban areas. The remaining animal samples fell within a range of means from 0.1 to 20 micro gr/gr wet weight, the higher value usually found in fatty tissues. Different tissues exhibited different n-alkane distribution profiles. It was extremely difficult to determine the origin of the n-alkanes identified. (EIS-Katz)  
W78-11013

**NITROGEN AND PHOSPHORUS MOVEMENT FROM AGRICULTURAL WATERSHEDS,**  
Agricultural Research Service, Columbia, CO. R. E. Burwell, G. E. Schuman, H. G. Heinemann, and R. G. Spomer.  
Journal of Soil and Water Conservation, Vol. 32, No. 5, p 226-230, September-October, 1977. 6 tab, 13 ref.

Descriptors: \*Nitrogen, \*Phosphorus, Nutrients, Fertilizers, Fertilization, Watersheds(Basins), Iowa, Runoff, Erosion, \*Soil erosion, \*Path of pollutants, \*Agricultural watersheds, \*Agricultural runoff.

A five-year study on Missouri Valley deep loess watersheds near Treynor, Iowa, to characterize the movement of nitrogen (N) and phosphorus (P) as influenced by applied fertilizer and conservation practices was conducted. Presented is watershed budget-accounting information for measured N and P movement that included (1) corn crop use, (2) surface runoff losses, (3) deep percolation, and (4) subsurface discharge. Erosion control and the application of N and P fertilizer at rates recommended for annual crop use minimized losses of these nutrients from the watersheds. (Skogerboe-Colorado State)  
W78-11040

**NITRATE DISTRIBUTION AND VARIABILITY IN IRRIGATED FIELDS OF NORTHEASTERN COLORADO,**  
Colorado State Univ., Fort Collins. Dept. of Agronomy.  
For primary bibliographic entry see Field 3F.  
W78-11049

**SAMPLING DISTRIBUTION OF NITRATES IN IRRIGATED FIELDS,**  
Colorado State Univ., Fort Collins. Dept. of Agronomy.  
For primary bibliographic entry see Field 3F.  
W78-11051

**STERILITY IN RICE CULTIVARS AS INFLUENCED BY MSMA RATE AND WATER MANAGEMENT,**  
Arkansas Agricultural Experiment Station, Stuttgart. Rice Branch Experiment Station. B. R. Wells, and J. T. Gilmour.  
Agronomy Journal, Vol. 69, No. 3, p 451-454, May-June, 1977. 3 tab, 16 ref.

Descriptors: \*Rice, Crop production, Arkansas, Cotton, Soils, Soil investigations, Soil water, Saturated soils, \*Water management(Applied), \*Monosodium methanearsonate.

An expansion of rice acreage in Arkansas has resulted in rice being produced on soils with a history of cotton production. Most of these cotton soils have had repeated applications on monosodium methanearsonate (MSMA) as a herbicide. There is some evidence that arsenical residues in the soil can lead to sterility in rice. A field experiment was conducted on a Crowley silt loam soil in 1975 to evaluate the influence of MSMA on plant growth and yield of rice. (Skogerboe-Colorado State)  
W78-11053

**MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEM ANALYSIS - APPLICATION TO MEDIUM SIZE COMMUNITIES: URBAN STORM-DRAINAGE SYSTEMS PLANNING,**  
Purdue Univ., Lafayette, IN. Water Resources Research Center.  
For primary bibliographic entry see Field 6A.  
W78-11058

**CALIBRATION AND SENSITIVITY ANALYSIS OF THE CONTINUOUS RUNOFF SIMULATION MODEL 'STORM',**  
Purdue Univ., Lafayette, IN. Water Resources Research Center.  
For primary bibliographic entry see Field 2A.  
W78-11060

**SEARCH FOR NITRIFYING AGENTS IN WATER AND SOILS AS SOURCES OF NITRATES IN SURFACE WATER,**  
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.  
N. A. Phillips, and R. L. Todd.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 700. Price codes: A05 in paper copy, A01 in microfiche. Report ERC-02-78, February 1978. 89 p, 9 tab, 61 ref, append. OWRT A-066-GA(1), 14-34-0001-6011.

Descriptors: Ammonia, \*Nitrate-nitrogen, Fertilizer, Calcium, Magnesium, Sodium, Soils, \*Nitrates, \*Water pollution sources, Soil chemistry, \*Nitrosomonas, \*Nitrobacter, \*Nitrifying bacteria, Silicon, Total nitrogen.

The soil and surrounding water of seventeen diverse types of watersheds were analyzed over a one-year sampling period for a variety of parameters. Terrestrial nitrifying populations were quantified. Concentrations of ammonia, nitrate, and total nitrogen and pH were measured from soil extracts. The water was analyzed for concentrations of nitrate, ammonia, and seven selected cations. The terrestrial nitrifying bacteria were positively correlated to nitrate and cation loss from so-called 'natural' systems, i.e., ones that were not fertilized. Those heavily managed (fertilized) systems showed no relationship between nitrate and cation discharge and numbers of nitrifying bacteria. The average concentration of nitrate-nitrogen lost from natural systems was 0.07 mg/l over the year. That lost from the fertilized systems averaged 0.47 mg/l, approximately a 7-fold increase. Similar relationships were found for average cation discharge.  
W78-11063

**PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME I. SUMMARY REPORT AND VERIFICATION,**  
Bureau of Reclamation, Denver, CO. Engineering and Research Center.  
For primary bibliographic entry see Field 5G.  
W78-11088

**PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW, VOLUME V. DETAILED RETURN FLOW SALINITY AND NUTRIENT SIMULATION MODEL,**  
Bureau of Reclamation, Denver, CO. Engineering and Research Center.  
For primary bibliographic entry see Field 5G.  
W78-11092

**A MATHEMATICAL MODEL OF THE ACCUMULATION OF RADIONUCLIDES BY OYSTER (C. VIRGINICA) AQUACULTURED IN THE EFFLUENT OF A NUCLEAR POWER REACTOR TO INCLUDE MAJOR BIOLOGICAL PARAMETERS,**  
Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service. C. T. Hess, C. W. Smith, and A. H. Price.  
Health Physics, Vol 33, No 2, August 1977, p 121-130, 10 fig, 14 ref.

Descriptors: Environmental effects, \*Water pollution, Radioactive wastes, \*Radioisotopes, Nuclear powerplants, \*Oysters, Effluent, Absorption, \*Mathematical models.

A mathematical model for the uptake, accumulation and loss of radionuclides by oysters cultured in the effluent of a nuclear power reactor is presented. Field measurements of these variables were made at four stations. Comparison of monthly measurements of the specific activity for  $\text{Co}^{58}$ ,  $\text{Co}^{60}$ ,  $\text{Mn}^{54}$ ,  $\text{Cs}^{134}$  and  $\text{Cs}^{137}$  in oysters from these stations with model calculations showed close agreement over all ranges of variation seen. It was noted that one of the real values of this model, in addition to the one of predicting the time dependence of the specific activity of radionuclides in oysters located at various positions with respect to the discharge point of source of radionuclides, is that it can be used in reverse to calculate optimum release schedules from the nuclear power plant. (Chilton-ORNL)  
W78-11112



# EFFECT OF A THERMAL GENERATING STATION ON DISSOLVED SOLIDS AND HEAVY METALS IN A PRAIRIE RESERVOIR,

Saskatchewan Dept. of the Environment, Regina, Inland Waters Directorate.

R. J. Allan, and D. J. Richards.  
Scientific Series No. 93, 1978, 20 p, 13 fig, 30 ref, 8 tab.

Descriptors: \*Thermal powerplants, \*Dissolved solids, \*Heavy metals, \*Reservoir operation, \*Reservoir releases, Bottom sediments, Bottom sampling, Toxicity, Canada, \*Boundary Dam Reservoir(Sask), \*Lake Wabamun(Sask), \*Long Creek(Sask), \*Saskatchewan.

Boundary Dam Reservoir, in the southern Prairie region of Saskatchewan provides condenser cooling water used in thermal electric power generation. The reservoir was formed by damming a typical Prairie stream of generally poor water quality (in terms of dissolved and suspended solids) and intermittent flow. Since 1960, recorded data for dissolved solids show that downstream water quality has been generally better than that of the inflowing stream (when flow occurred) and that no continual trend to higher downstream concentrations has been recorded. Downstream dissolved solids are primarily controlled by: (1) the efficiency of the spring runoff in replacing high dissolved solids winter reservoir water with much lower dissolved solids spring runoff water derived largely from snowmelt; (2) post-runoff loading of salts to the reservoir by the inflowing stream; and (3) sedimentation/precipitation especially in low flow years. In the context of these normal 'Prairie reservoir' processes, the continued effect of forced evaporation is apparently negligible at the generating capacities up to 1977. Toxic metal analyses of water at Boundary were inconclusive because of low concentrations, but bottom sediments showed a tendency for metal concentration behind the dam, a phenomenon common in the reservoirs. Surface sediment concentrations of zinc at Boundary and zinc, lead and copper at Wabamun may be elevated due to the operation of the generating stations but are still of a magnitude commonly found in lakes where no contamination is suspected. (WATDOC)  
W78-11189

## TRANSVERSE DISPERSION IN MEANDERING CHANNELS,

Canada Centre for Inland Waters, Burlington (Ontario).

R. G. Krishnapan, and Y. L. Lau.  
Scientific Series No. 75, 1977, 98 p, 23 fig, 11 ref, 2 tab, 4 append.

Descriptors: \*Flow, \*Dispersion, \*Distribution patterns, \*Velocity, \*Pollutants, \*Natural streams, \*Channels, Channel flow, Meanders, Currents(Water), Erosion, Deposition(Sediments), Laboratory tests, Theoretical analysis.

The transverse dispersion process in meandering channels has been studied in the Hydraulics Laboratory of the Canada Centre for Inland Waters and a detailed description of the study is presented in this report. Using the theory of dimensions, it has been established that the dimensionless dispersion coefficient in the transverse direction in meandering channels is a function of the friction factor, ratio of meander amplitude to width and the ratio of width to hydraulic radius. An attempt is made to establish the functional relationship by measuring the dispersion coefficients for various values of the above-mentioned parameters. The meandering channels used for this study has realistic bottom configurations which resulted from the scouring and deposition of the sand forming the bottom of the channels in contrast to the rigid bottom channels used in the previous studies. The dispersion coefficients were evaluated using the Generalized Change of Moment Method, proposed by Holley, with the mea-

sured values of the flow depth, velocity and concentration of salt solution, which is used as a tracer solution in this present study. A numerical method has been developed in this study to predict the concentration distribution of a pollutant that is injected continuously into a meandering channel. (WATDOC)  
W78-11196

## QUALITY OF IRRIGATION WATER AND SURFACE RETURN FLOWS FROM SELECTED AGRICULTURAL LANDS IN NEVADA DURING THE 1974 IRRIGATION SEASON,

Max C. Fleischmann Coll. of Agriculture, Reno, NV.

W. W. Miller, J. C. Guitjens, and C. N. Mahannah.  
Journal of Environmental Quality, Vol. 6, No. 2, p 193-200, April-June 1977. 6 fig, 3 tab, 26 ref.

Descriptors: \*Return flow, \*Water quality, \*Irrigation water, \*Nevada, Water quality control, Tailwater, Phosphorus, Pollutants.

Agriculture has been identified as a major contributor of pollutants to surface waters. The purpose of this investigation was to gain knowledge of pollutants and pollutant loads carried in surface return flows to receiving waters. Information of this nature is needed by those agencies having administrative responsibility for water quality control. Quantitative and qualitative measurements of irrigation applications (head water) and surface return flows (tail water) were conducted on four sites at three locations in the Carson Valley area of Nevada to investigate the change in pollutant loads of surface waters entering and leaving agricultural units. Dissolved oxygen (DO), biochemical oxygen demand (BOD), total dissolved solids (TDS), NO<sub>3</sub>-N, PO<sub>4</sub>-P, SO<sub>4</sub>, and turbidity were considered as major constituents of water quality. Concentrations were combined with flow volumes to compute the constituent loading per irrigation and net infiltrated amounts or seasonal contributions in the surface return flow. Phosphorus and BOD were the major agricultural pollutants contributed by irrigation surface return flows. Net infiltrated amounts of TDS, NO<sub>3</sub>-N, and other soluble constituents were recorded. Dissolved oxygen concentrations in head and tail waters were critically low. River standards for DO might be better expressed as a maximum permissible dissolved oxygen deficit for water at a given temperature carrying a given amount of BOD. Additional investigations should be undertaken to delineate possible interactions among pollutant constituents. Water quality variations of individual samples should be expressed in statistical terms so that it is possible to identify pollutant interdependencies and to establish an optimized sampling frequency. (Skogerboe-Colorado State)  
W78-11199

## INORGANIC PHOSPHORUS SPECIES AND TRANSFER MECHANISMS IN SOILS TO SEDIMENTS FOR TWO SMALL KANSAS WATERSHEDS,

Kansas Water Resources Research Inst., Manhattan.

C. W. Kimbrough, C. E. Burkhead, and E. E. Angino.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 955, Price codes: A09 in paper copy, A01 in microfiche. Contribution No. 196, July 1978. 189 p, 27 fig, 13 tab, 146 ref, 6 append. OWRT A-082-KAN(1), 14-34-0001-7035.

Descriptors: \*Phosphorus, Soils, \*Sediments, Solubility, Phosphorus compounds, Management, Water pollution sources, Transfer mechanisms, Rural watersheds, \*Kansas lakes, \*Watershed management.

The soils of two small eastern Kansas rural watersheds and the sediments of their catchment basins were sampled during 1976 and 1977. The ob-

jective of the study was to determine the nature of the chemical reaction products controlling orthophosphate availability as the sediments were subjected to varying conditions during their movement from the watershed and into the inundated soils of the basins. Samples were collected on the basis of soil use and drainage patterns. Sediments were obtained as undisturbed cores with a sampler developed during this research. Cores were frozen in liquid nitrogen upon collection and thawed just prior to sectioning and drying. Solubility criteria were used to identify the inorganic phosphate compounds in the samples. Cation content and pH appeared to determine the dominant orthophosphate. As acid sediments were transported into areas of limestone outcroppings and into hard waters, phosphorus availability was controlled by the calcium phosphate compounds. In acid soil phosphorus availability was determined by iron (strengite) and aluminum (variscite) phosphates. The eastern shore of one of the lakes had been fertilized with superphosphate for several years in an effort to increase the biomass. Within sediments of this lake, there was uniform availability of phosphate within strata.  
W78-11206

## BENZIMIDAZOLE FUNGITOXICANTS IN VIRGINIA SOILS: MOVEMENT, DISAPPEARANCE, AND EFFECT ON MICROORGANISMS,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.

D. B. Janutolo, and R. J. Stipes.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 932, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 113, June 1978. 64 p, 12 fig, 11 tab, appendix (13 tab), 45 ref. OWRT A-068-VA(1).

Descriptors: \*Fungicides, \*Pesticides, Surfactants, Soil thin-layer chromatography, Plant disease control, \*Virginia, \*Path of pollutants, Water pollution effects, Pollutant identification, \*Fungitoxics, Fungistats, Residues, Benomyl, Benlate, Lignasan BLP, Carbendazim, Plant chemotherapy.

Knowing movement, degradation, disappearance, and effect of a soil-applied pesticide on microorganisms in soil is essential before its widespread usage is permitted. This study sought to: (1) determine the movement benzimidazole fungitoxics in Appling, Sassafra, Wickham, and Frederick soil types by soil thin-layer chromatography (STLC), soil columns, and in situ models; (2) study the disappearance of soil-applied benzimidazole compounds at different concentrations and soil temperatures; and (3) observe the effect of benzimidazole fungitoxics on microbial populations. Results by STLC showed that Tween 20 and Tween 80 surfactants moved the compounds farther in distance than water and Span 60 surfactants. The fungitoxics moved farther in the A horizon than in the B horizon (except in Wickham). Movement of the fungitoxics through artificially packed laboratory soil columns was greater with Tween 80 than with water for all soils. Benomyl was confined to the top 5 cm of soil when leached with water through in situ columns, while MBCH3PO4 was detected at a 25-cm depth. Without the aid of surfactants, benomyl essentially was immobile in soil, while MBC and its salts had limited mobility. Adding surfactants greatly increased mobility of all compounds. The in situ movement data agreed with the other results. Results indicate that the half-life of MBC in soil is 3-6 months, and its disappearance is more rapid in high-pH soils than in low pH-soils; soil temperature had little effect. Over time, MBCH3PO4 incorporation did not unduly disrupt soil microbial populations. The research suggests that these specific fungitoxics would not pose a serious problem as soil or water contaminants.  
W78-11215

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5B—Sources Of Pollution

**REFRACTORY ORGANIC COMPOUNDS IN TREATED EFFLUENT AND THEIR REMOVAL BY SOIL, MILILANI, OAHU, HAWAII.** Hawaii Univ. Honolulu. Water Resources Research Center.  
For primary bibliographic entry see Field 5A.  
W78-11220

**DREDGING IN ESTUARIES - A GUIDE FOR REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS.** SYMPOSIUM/WORKSHOP PROCEEDINGS, MARCH 1977, RESTON, VIRGINIA, Research Triangle Inst., Research Triangle Park, NC.; and Oregon State Univ., Corvallis.  
For primary bibliographic entry see Field 2L.  
W78-11222

**A CRITICAL TECHNICAL REVIEW OF SIX ADDITIONAL HAZARD ASSESSMENT MODELS.** Enviro Control, Inc., Rockville, MD.  
A. H. Rausch, R. M. Kumar, and C. J. Lynch.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A044 198, Price codes: A10 in paper copy, A01 in microfiche. Coast Guard Office of Research and Development Report No. CG-D-54-77, March 1977. 202 p., numerous fig., tab., 4 append. DOT-CG-33,377-A.

**Descriptors:** \*Hazards, \*Model studies, \*Oil spills, \*Chemical wastes, Transportation, Dispersion, Water pollution, Reviews, \*Outer Continental Shelf, \*Hazardous materials, Spreading.

A critical technical review is presented of six simulation models currently being used in connection with the following U.S. Coast Guard research programs; the Vulnerability Model, a simulation system for assessing damage resulting from spills of hazardous materials; the Chemical Hazards Response Information System (CHRIS), as described in Assessment Models in Support of the Hazard Assessment Handbook (AMSHAH); and the Hazard Assessment Computer System (HACS). These research programs are concerned with describing, in a predictive manner, the behavior of maritime spills of hazardous materials and the damages that may result from such spills. The primary objective of this review is to evaluate the validity of the models. (Sinha - OEIS)  
W78-11224

**EXCHANGE OF MANGANESE, IRON, COPPER, AND ZINC BETWEEN DISSOLVED AND PARTICULATE FORMS IN THE NEWPORT RIVER ESTUARY, NORTH CAROLINA.** Oregon State Univ., Corvallis. School of Oceanography.  
D. W. Evans.  
Available from the National Technical Information Service, Springfield, VA 22161 as RI-O-2227 T1211, Price codes: A11 in paper copy, A01 in microfiche. Ph D Thesis, June 1977. 238 p., 24 fig., 21 tab., 185 ref., 3 append.

**Descriptors:** \*Metals, \*Water quality, \*Baseline studies, Manganese, Iron, Copper, Zinc, North Carolina, Estuaries, Outer Continental Shelf, Newport River Estuary(NC), Exchange processes.

Exchange of manganese, iron, copper, and zinc between solution and particulate phases was studied in the Newport River estuary, North Carolina. Metal analyses were by flameless atomic absorption spectrophotometry, those in solution after concentration by Chelex-100 resin. Longitudinal sampling transects in the estuary in October 1974, and February and April 1975, showed trends of dissolved metal concentrations versus salinity interpretable in terms of exchange of the metals between solution and particulate phases. A simple mixing model explained variations of dissolved

metal concentrations within the estuary by river and seawater inputs and outputs and internal sources and sinks reflecting the exchange processes. Metal concentrations on suspended particulate matter provided corollary evidence of metal exchanges. (Sinha - OEIS)  
W78-11230

**A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOLUME IX, THE COMPUTER PROGRAM.** Rand Corp., Santa Monica, CA.  
J. J. Leendertse, and A. B. Nelson.  
Report No. R-2298-RC, April 1978. 90 p., 3 ref., 3 append.

**Descriptors:** \*Water quality, \*Water pollution sources, \*Computer programs, \*Coasts, \*Estuaries, Baseline studies, Environmental effects, Resources development, Models, New York, Outer Continental Shelf, Simulation models.

The computer program in its present form can be used to compute the flow and pollutant distributions in a certain region if: the hydrodynamic and transport equations described are representative of the fluid motions and transport of constituents; information is available about depth to a certain reference level; the bathymetry can be approximated with sufficient detail (computer memory and computer time requirements per run are proportional to the second and roughly third power, respectively, of the reciprocal of the space grid size); sufficient data are available for model adjustment; input water level histories at a single boundary at the left side of the model are available for forcing the model; time-varying wind and discharge information is available; and currents are relatively weak and the system quite well damped so that stability conditions of the advection terms are not exceeded. (See also W76-13093; W76-08317; W75-07042; W72-06980; W73-07935; and W71-04038. (Sinha - OEIS)  
W78-11231

**LABORATORY AND FIELD STUDIES ON THE LONG-TERM EFFECTS OF PETROLEUM HYDROCARBONS ON BENTHIC MARINE INVERTEBRATES.** Battelle Pacific Northwest Lab., Richland, WA.  
For primary bibliographic entry see Field 5C.  
W78-11237

**GEOCHEMISTRY OF THE MATTOLE RIVER OF NORTHERN CALIFORNIA.** Geological Survey, Menlo Park, CA. Water Resources Div.  
For primary bibliographic entry see Field 2K.  
W78-11255

**URBAN STORMWATER RUNOFF DATA FOR A RESIDENTIAL AREA, POMPANO BEACH, FLORIDA.** Geological Survey, Tallahassee, FL. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11258

**CHEMICAL AND BIOLOGICAL QUALITY OF LAKES FAITH, HOPE, AND CHARITY, AT MAITLAND, FLORIDA, WITH EMPHASIS ON THE EFFECTS OF STORM RUNOFF AND BULK PRECIPITATION, 1971-74.** Geological Survey, Tallahassee, FL. Water Resources Div.  
N. G. Gaggiani, and A. G. Lamonds.  
Open-file report 77-491, March 1978. 94 p., 7 fig., 23 tab., 12 ref.

**Descriptors:** \*Lakes, \*Water quality, \*Inflow, \*Rainfall, \*Storm runoff, Water pollution effects,

Nutrients, Algae, Thermal stratification, Dissolved solids, Data collections, Baseline studies, Road construction, Florida, \*Maitland(FL), \*Lake Faith, \*Lake Hope, \*Lake Charity.

Located in a closed basin, near Orlando, FL, Lake Faith, Hope, and Charity cover a combined area of 132 acres and are surrounded by residential, citrus grove and undeveloped areas. All of these areas affect the water quality of the lakes through storm runoff and transport of windborne material. During a study from April 1971 to June 1974, stages of Lakes Faith, Hope, and Charity declined 1.5, 1.4, and 3.0 ft, respectively, because the rainfall was 3.78 in. below average for the area. Inflow to the lakes during this 3-year period was approximately 1,966 acre-ft of which 84 percent was by rainfall and 16 percent was by storm runoff. Rainfall and runoff brought in 82 tons of dissolved solids of which storm runoff carried 51 tons and bulk precipitation carried 32 tons. Dissolved solids concentrations in the lakes were relatively low, averaging 91, 132, and 212 mg/liter for Lakes Faith, Hope, and Charity, respectively. Major ions, trace elements and nutrients were present in the lakes in relatively low concentrations. Phytoplankton and coliform population showed sharp seasonal fluctuations with the maximum population generally occurring during the warmer months. Blue-green algae predominated in all three lakes. (Woodard-USGS)  
W78-11259

**NITRATE-NITROGEN REMOVAL FROM SOIL PROFILES BY ALFALFA.** Southwestern Great Plains Research Center, Bushland, TX.  
A. C. Mathers, B. A. Stewart, and B. Blair.  
Journal of Environmental Quality, V. 4, No. 3, p. 403-405, July-Sept., 1975. 3 fig., 3 tab., 12 ref.

**Descriptors:** \*Nitrates, \*Soil profiles, \*Alfalfa, Crop response, Leaching, Farm wastes, \*Land application, Groundwater quality.

Previously utilized Pullman clay loam plots that had received 0, 22, 45, 112, and 224 metric tons/ha of manure or ammonium nitrate (224 kg N/ha) annually for 3 years were used in a new study to determine the extent that nitrate could be removed by alfalfa. Nitrate-nitrogen and water contents of the soil profile were determined by 30-cm increments to a 6-m depth prior to planting. It was found that the amount of nitrate-nitrogen removed and the removal depth would depend upon such factors as available water and root activity. The depth of nitrate-nitrogen removal will depend on the rooting of the alfalfa. Alfalfa roots can extend to depths greater than 6 m. Alfalfa seems to have the capability to remove nitrate-nitrogen at depths below the rooting depth of most crops. Planting alfalfa on soil high in nitrate-nitrogen could reduce the amounts of nitrate-nitrogen leaching into groundwater. Total nitrogen uptake by alfalfa was directly related to alfalfa yield. (Merryman-East Central)  
W78-11277

**NUTRIENT DISTRIBUTION IN THE ST. LAWRENCE ESTUARY.** McGill Univ., Montreal (Quebec) Marine Sciences Centre.  
For primary bibliographic entry see Field 5C.  
W78-11290

**VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL A IN LAKE MICHIGAN.** Wisconsin Univ.-Milwaukee. Dept. of Zoology.  
For primary bibliographic entry see Field 5C.  
W78-11291

**INHIBITION OF NITROGEN VOLATILE AGRI-CULTURAL CO.**

For primary bibliographic entry see Field 5C.

**SC. Effect**

**THE MUSSA... SAY ORGA... WATER, Marine Lab. L.M. Davies Marine Pollu... fig. 1 tab., 14**

**Descriptors:** Path of poll... data collec... techniques, Growth rat... Forth, Scot...

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**THE AMO... Cremer and A. J. O'Su... Marine Po... fig. 1 ref.**

**Descriptor:** \*Disasters effects, V. Aquatic p... cial shellf... \*Crude oil... Coast.

**This repo... events su... on the Br... most mas... fects of t... vegetation discussed on the lon... W78-10535**

**EFFECT: EIDER E... Fish and Wildlife... P. H. Alb... Marine P... tab., 17 re**

**Descriptor:** \*Toxicity Mortality Clutch, I... ion effect Hatching

**An oil sp... the trans... cubating... No. 2 fu... eider egg... Clutches... oil had**

# INHIBITION OF PHOTOSYNTHESIS AND NITROGEN FIXATION IN ALGAE BY VOLATILE NITROGEN BASES,

Agricultural Experiment Station, Fort Collins, CO.  
For primary bibliographic entry see Field 5C.  
W78-11295

## 5C. Effects Of Pollution

### THE MUSSEL MYTILUS EDULIS AS A BIOASSAY ORGANISM FOR MERCURY IN SEAWATER,

Marine Lab., Aberdeen (Scotland).  
I.M. Davies, and J. M. Pirie.  
Marine Pollution Bulletin, Vol 9, p 128-132, 1978. 5 fig, 1 tab, 14 ref.

Descriptors: \*Mercury, \*Bioassay, \*Mussels, Path of pollutants, Heavy metals, Metals, On-site data collections, Chemical analysis, Analytical techniques, Water analysis, Animal populations, Growth rates, Water quality, Estuaries, Firth of Forth, Scotland.

Surveys of natural populations of mussels have identified areas of mercury contamination in the Firth of Forth, Scotland. A field bio-assay technique has been devised which accurately reflects the mean total mercury concentration in the surrounding seawater. The detection limit of the technique is estimated at 5-20 nanograms Hg l.l., and consequently, the method can detect comparatively small enhancements over background mercury concentrations, in estuarine and sea water. (EIS-Deal)  
W78-10537

### THE AMOCO CADIZ OIL SPILL,

Cremer and Warner, London, (England).  
A.J. O'Sullivan.  
Marine Pollution Bulletin, Vol 9, p 123-128, 1978. 2 fig, 1 ref.

Descriptors: \*Oil, \*Oil spills, \*Oil pollution, \*Disasters, Organic compounds, Water pollution effects, Water pollution sources, Water birds, Aquatic populations, Beaches, Coasts, Commercial shellfish, Algae, Wildlife, Economic impact, \*Crude oil, \*Oil tankers, \*Amoco cadiz, Brittany Coast.

This report gives a preliminary account of the events surrounding the wreck of the Amoco Cadiz on the Brittany coast in March, which caused the most massive oil pollution on record. The initial effects of the oil on sheltered coves, sandy shores, vegetation, wildlife, and the regional economy are discussed. An outline of studies being undertaken on the long-term effects of the spill is presented.  
W78-10538

### EFFECTS OF NO. 2 FUEL OIL ON COMMON EIDER EGGS,

Fish and Wildlife Service, laurel, MD. Patuxent Wildlife Research Center.  
P. H. Albers, and R. C. Szaro.  
Marine Pollution Bulletin, Vol 9, p 138-139, 1978. 1 tab, 17 ref.

Descriptors: \*Oil, \*Oil spills, \*Oil pollution, \*Toxicity, \*Common Eider Duck, \*Bird eggs, Mortality, Waterfowl, Embryonic growth, Stage, Clutch, Nests, Organic compounds, Water pollution effects, Path of pollutants, Reproduction, Hatching, Nesting, \*No. 2 Fuel Oil.

An oil spill near a breeding colony could result in the transfer of oil from the plumage and feet of incubating birds to their eggs. Microlitre amounts of No. 2 fuel oil were applied externally to common eider eggs in an island breeding colony in Maine. Clutches of eggs treated with 20 microliters of fuel oil had significantly greater embryonic mortality

than the control clutches when they were examined 7 days after treatment. The results are similar to those of an earlier study of artificially incubated common eider eggs and indicate that nest site conditions do not affect embryo-toxicity of No. 2 fuel oil. (EIS-Deal)  
W78-10539

### EFFECT OF QUATERNARY AMMONIUM COMPOUNDS ON SOME AQUATIC PLANTS,

Canterbury Univ., Christchurch (New Zealand).  
Dept. of Botany.  
J. R. L. Walker, and S. Evans.  
Marine Pollution Bulletin, Vol. 9, p 136-137, 1978. 2 fig, 1 tab, 5 ref.

Descriptors: \*Ammonium compounds, \*Algicides, \*Chlorella, \*Toxicity, Ammonia, Algae, Growth rates, Mortality, Cytological studies, Chlorophyta, Aquatic plants, Surfactants, Bioassay, Plant pathology, Plant physiology, Mortality, \*Duckweed, Quaternary ammonium compound.

The toxic effects of various types of quaternary ammonium compound (QAC) upon a unicellular green alga (*Chlorella* sp.) and a duckweed (*Spirodela oligorhiza*) have been investigated. In general all types of QAC suppressed plant growth when present at concentrations above 10 to the 5th power M (approximately 3-5 ppm). With the duckweed sublethal levels of QAC caused yellowing or browning of the frond margins and the production of smaller sized fronds, whilst with *Chlorella* QAC's affected both the size, shape and internal organization of the cell; death appeared to be due to disruption of the chloroplast structure. (EIS-Deal)  
W78-10540

### APPARATUS FOR THE CONTINUOUS DISSOLUTION OF POORLY WATERSOLUBLE COMPOUNDS FOR BIOASSAYS,

California Univ., Berkeley. Sanitary Engineering Research Lab.  
For primary bibliographic entry see Field 5A.  
W78-10541

### COMPOSITION AND SOURCES OF POLLUTANT HYDROCARBONS IN THE SEVERN ESTUARY,

Bristol Univ. (England). Organic Geochemistry Unit.  
For primary bibliographic entry see Field 5B.  
W78-10542

### HEPATIC STORAGE ALTERATION OF VITAMIN B12 BY CADMIUM IN A FRESH-WATER FISH,

European Atomic Energy Community, Ispra (Italy). Dept. of Physical and Natural Sciences.  
M. Merlino.  
Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 767-771, 1978. 2 tab, 8 ref.

Descriptors: \*Cadmium, \*Fish physiology, \*Sunfishes, \*Toxicity, \*Vitamins, Animal metabolism, Mode of Action, Freshwater fish, Biochemistry, Metabolism, Nutrients, Heavy metals, Metals, Water pollution effects, Tissue analysis, Liver, Bioaccumulation.

The antimetabolic effect of cadmium on hepatic and renal metabolism of vitamin B12 was examined. Controlled studies using immature sunfish demonstrated that the presence of cadmium sulfate resulted in a decreased hepatic storage of vitamin B12. The cadmium acted to stimulate biliary excretion of the vitamin into the intestine and elimination through the gills. Renal activity was not found to be significantly altered. (EIS-Deal)  
W78-10543

### THE USE OF PERIPHYTON AS A MONITOR OF TRACE METALS IN TWO CONTAMINATED INDIANA LAKES,

Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.  
G. D. Johnson, A. W. McIntosh, and G. J. Atchison.  
Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 733-740, 1978. 2 fig, 3 tab, 19 ref.

Descriptors: \*Eutrophication, \*Periphyton, \*Bioindicators, \*Cadmium, \*Zinc, Monitoring, Trace elements, Metals, Lentic environment, Industrial wastes, Sediments, Algae, Water pollution effects, Path of pollutants, \*Methodology.

The results of this study are inconclusive as to whether or not periphyton is a reliable biological indicator of trace metal pollution in all lentic ecosystems. However, evidence indicates that where great differences exist in metal levels in water, periphyton may be a useful monitor. The presence of certain species in both lakes in areas of highest contamination may indicate a tolerance on the part of those species. (EIS-Deal)  
W78-10545

### TRENDS IN PCB CONTAMINATION IN DUTCH COASTAL AND INLAND FISHERY PRODUCTS 1972-1976,

Rijksinstituut voor Visserijonderzoek, Ymuiden (Netherlands).  
For primary bibliographic entry see Field 5B.  
W78-10546

### SOME OBSERVATIONS UPON THE CHEMICAL COMPOSITION OF THE STARFISH ASTERIAS RUBENS L., WITH PARTICULAR REFERENCE TO STRONTIUM UPTAKE,

London Univ (England). Dept. of Zoology.  
For primary bibliographic entry see Field 5A.  
W78-10547

### EVALUATION OF ANHYDROUS AMMONIA FOR FISHERY MANAGEMENT USES,

Texas Parks and Wildlife Dept., Ingram.  
J. A. Prentice, P. P. Durocher, and D. L. Pritchard.  
In: Proceedings of the Thirtieth Annual Conference, Southeastern Association of Fish and Wildlife Agencies, October 24-27, 1976, Jackson, Mississippi, p 88-89. 7 fig, 5 tab, 15 ref.

Descriptors: \*Ammonia, \*Fish management, \*Herbicides, \*Toxicity, \*Mortality, \*Fishkill, \*Toxins, \*Benthic fauna, \*Fish behavior, \*Catfish, \*Channel catfish, \*Bass, \*Sunfishes, Nitrogen compounds, Benthos, Water temperature, Piscicides, Aquatic plants, Water quality, On-site investigations, Seasonal.

Anhydrous ammonia was applied to ponds at average rates of 18-40 ppm to evaluate its use as a fish toxicant and aquatic herbicide. Ponds contained toxic levels of ammonia for 3-4 weeks after applications, depending on concentration, water temperature, and other factors. A regression model was developed to estimate specific dissipation times. Application of 15 ppm ammonia effected a high percent mortality to all fish species observed. Complete fish kills occurred at approximately 30 ppm ammonia. Any concentration above 15 ppm temporarily controlled most vegetation, regardless of season. Benthic organisms were reduced but not eliminated by any treatment. Anhydrous ammonia was found to be relatively inexpensive compared to other fish toxicants and aquatic herbicides. (EIS-Katz)  
W78-10549

### A COMPARISON OF HYDROCARBONS IN ANIMALS AND THEIR BENTHIC HABITATS,

Woods Hole Oceanographic Institution, MA.  
For primary bibliographic entry see Field 5B.  
W78-10550



## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects Of Pollution

**THE USE OF STIGEOCLONIUM SUBSECUNDUM (CHOLOROPHYCEAE) AS A BIOASSAY ORGANISM—III. RESPONSE TO INTERMITTENT CHLORINATION.** Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies. D. M. Trotter, A. C. Hendricks, and J. Cairns. Water Research, Vol. 2, p 371-375, 1978. 4 fig, 1 tab, 17 ref.

Descriptors: \*Cytological studies, \*Toxicity, \*Seasonal, Organic compounds, Water analysis, Water quality, Chemical analysis, Growth rates, Carbon, Analytical techniques, Solvents, Mammals, Rodents, \*Acetone, \*Ethanol, \*Chloroform, \*Methylene chloride.

The toxicity of intermittent chlorination to an attached filamentous green alga was found to be related to the biomass of the alga at the beginning of the bioassay. Minimal resistant biomass was a term used to describe the lowest biomass of algae able to survive and continue to grow when subjected to a specific level of chlorine at intervals of 6 h for a period of one week. This ability to survive was due to changes in the morphology of the algal filaments and the algal mat. (EIS-Deal) W78-10551

**STUDIES ON THE ANEMIA OF FISH - VIII. HEMORRHAGIC ANEMIA OF CARP CAUSED BY A HERBICIDE, MOLINATE.** Freshwater Fisheries Research Lab., Tokyo (Japan). H. Kawatsu.

Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43(8), 1977, p 905-912, 2 tab, 4 fig, 11 ref.

Descriptors: \*Herbicides, \*Toxicity, \*Mortality, Bioassay, Water pollution effects, Carp, Laboratory tests, Sulfur compounds, Fish pathology, Fish physiology, Growth, Molinate, Ordram, \*Hemorrhagic anemia, Hematology, \*Histology, Hemoglobin.

The toxicity of the herbicide, molinate, to carp was studied. The 21-day lethal concentration for the animal was estimated at 0.18 ppm. Anemia was found in carp exposed to molinate. This anemia was characterized with a drastic decrease in RBC and Hb levels. In blood smear preparations of carp with anemia, increase in number of immature erythrocyte was observed. However, no cytopathological change was found in their erythrocytes. Microaneurysm and punctate hemorrhage were frequently observed in the gill of anemic carp. Histologically, these alterations consisted of swelling of gill lamella, dilation and PAS-positive-thickening of capillary walls, and deterioration of pillar cells. No hemosiderin was demonstrated in the spleen of carp with anemia. Thus, it is concluded that herbicide molinate evoked anemia in carp, and this anemia was due to loss of blood resulting from the alteration of gill-capillary wall. (See also W74-12736) (EIS-Katz) W78-10552

**DDK AND PCBS IN EGGS OF NORWEGIAN SEABIRDS.** Tromsø Univ., (Norway). Inst. of Biology and Geology. For primary bibliographic entry see Field 5B. W78-10553

**THE IMPACT OF FRENCH NUCLEAR INSTALLATIONS ON THE AQUATIC ENVIRONMENT, IMPACT DES INSTALLATIONS NUCLEAIRES FRANCAISES SUR L'ENVIRONNEMENT AQUATIQUE.** CEA Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les Durance (France). Section de radioecologie. J. C. Amiard.

Vol. Milieu, Vol. XXVI, fasc. 2, ser B., p 319-340, 1976.

Descriptors: \*Water pollution effects, \*Aquatic environment, Nuclear energy, \*Nuclear power plants, Nuclear reactors, \*Nuclear wastes, Radioactive wastes, Radioecology, \*Radioactive pollution, \*France, Marine environment.

The different sources of radioactive pollutions of the aquatic environment due to industrial utilization of nuclear energy are reviewed. Data, available in the literature, concerning radioactive pollution measurements of marine and freshwater environments are synthesized. Problems which may arise in a near or distant future because of nuclear energy utilization are then approached, and the major lacks in radioecology are listed. (EIS-Katz) W78-10555

**REPRODUCTIVE PARAMETERS AND EGG CONTAMINANT LEVELS OF GREAT LAKES HERRING GULLS.** Canadian Wildlife Service, Ottawa (Ontario). Toxic Chemical Section. For primary bibliographic entry see Field 5B. W78-10556

**HYDROLYSIS AND PHOTOLYSIS OF THE LAMPICIDE 2', 5-DICHLORO-4'-NITROSALICYLANILIDE (BAYER 73).** Fish and Wildlife Service, Warm Springs, GA. Southeastern Fish Control Lab. D. P. Schultz, and P. D. Harman. Investigation in Fish Control, No. 85, p 1-5, 3 tab, 1 fig, 6 ref. 1978.

Descriptors: \*Water pollution effects, \*Chemical analysis, Laboratory tests, Hydrolysis, \*Degradation(Decomposition), Methodology, Hydrogen ion concentration, \*Toxicity, Piscicides, Bayer 73, \*Lampicide, 2'-5 Dichloro-4'-Nitrosalicylanilide, Degradation products.

The hydrolysis and photolysis of the lampicide Bayer 73 was studied by using 14C-Bayer 2353 (the non-salt form of Bayer 73). No hydrolysis of 14C-Bayer 2353 occurred in pond water or in distilled water buffered at pH 5.0, 6.9, or 8.7 after 56 days. During exposure to long-wave UV light, 14C-Bayer 2353 degraded rapidly on silica gel thin layer chromatographic plates and on glass slides. After exposures of 24 h and 168 h, less than 50 and 5%, respectively, of the remaining radioactivity was parent-compound. After exposure of an aqueous solution of 14C-Bayer 2353 to long-wave UV light for 14 days, only 5% of the remaining radioactivity was parent compound. (EIS-Katz) W78-10557

**CHRONIC AND SIMULATED USE-PATTERN EXPOSURES OF BROOK TROUT (SALVELINUS FONTINALIS) TO 3-TRIFLUOROMETHYL-4-NITROPHENOL (TFM).** Fish and Wildlife Service, Columbia, MO. National Fisheries Research Lab. W. P. Dwyer, F. L. Mayer, J. L. Allen, and D. R. Buckler. Investigations in Fish Control No. 84, p 1-6, 7 tab, 30 ref. (1978).

Descriptors: \*Brook trout, Bioassay, \*Mortality, \*Toxicity, Freshwater fish, \*Laboratory test, Great Lakes, Lake fisheries, Lampreys, Fish physiology, Growth, Reproduction, Fish eggs, Juvenile fish, \*TFM, 3-Trifluoromethyl-4-nitrophenol, Sea Lamprey, Petromyzon marinus.

Effects of the lampicide (TFM) on brook trout (*Salvelinus fontinalis*) were compared under conditions of continuous (chronic) exposure, and under conditions simulating those used in the application of TFM in tributary streams of the Great Lakes for control of the sea lamprey (*Petromyzon marinus*). Chronic exposure of adult brook trout to concentrations of 4.0 mg/l or higher caused deleterious effects on growth, spawning, survival

during spawning, and eye condition. Hatchability and viability of the eggs were reduced. Growth and survival were reduced in the fry at TFM concentrations of 1.6 mg/l or higher. No deleterious effects were noted at lower concentrations. The only effect observed in fish after simulated use-pattern exposure to TFM was a decrease in survival of adults tested at 15C. (EIS-Katz) W78-10558

**SURVIVAL OF TWO SPECIES OF FRESH-WATER CLAMS, CORBICULA LEANA AND MAGNONAIAS BOYKINIANA, AFTER EXPOSURE TO ANTIMYCIN.** Fish and Wildlife Service, La Crosse, WI. Fish Control Lab. L. L. Marking, and J. H. Chandler, Jr. Investigations in Fish Control, No. 83, 1978, p 1-5, 4 tab, 13 ref.

Descriptors: Molluscs, \*Clams, \*Benthos, \*Toxicity, Mortality, Bioassays, Laboratory tests, Methodology, On-site investigations, \*Antimycin A, \*Asiatic clam, Corbicula, Magnoniaias, Latent mortalities, Flow through Bioassay.

The Asiatic clam, *Corbicula leana* Prime, and a clam native to the southern United States, *Magnoniaias boykiniana*, were exposed to the fish toxicant antimycin at several concentrations for various periods and then placed in an untreated earthen pond for posttreatment observation. Both species survived the concentrations and exposure periods usually used in field application. However, latent mortalities were observed in the pond 3 months after a 30-day flow-through exposure of *Corbicula* to 3.6 to 30 ug/l of antimycin. A single treatment (2 ug/l) in an earthen pond did not result in significant mortalities of *Corbicula* during 22 weeks. (EIS-Katz) W78-10559

**RETENTION OF SMALL PARTICLES BY THE GILLS OF THE JAPANESE OYSTER (IN JAPANESE).** Hiroshima Prefecture Fisheries Experiments Station, Ono (Japan). For primary bibliographic entry see Field 5B. W78-10560

**THE EFFECT OF METHYLMERCURIC CHLORIDE, CADMIUM CHLORIDE, AND LEAD NITRATE ON SIX BIOCHEMICAL FACTORS OF THE BROOK TROUT (SALVELINUS FONTINALIS).** Environmental Research Lab.-Duluth, MN. G. Christensen, E. Hunt, and J. Fiandt. Toxicology and Applied Pharmacology, Vol. 42, p 523-530, 1977. 3 tab, 20 ref.

Descriptors: \*Brook trout, Metals, \*Mercury, Cadmium, Lead, Bioassay, Toxicity, \*Water pollution effects, Biochemistry, Laboratory tests, \*Fish physiology, Pathology, \*Methylmercury chloride, \*Cadmium chloride, \*Lead nitrate, Tissue residues, \*Threshold indices of toxicity.

The effect of methylmercuric chloride, cadmium chloride and lead nitrate on six biochemical factors of the brook trout (*salvelinus fontinalis*). Brook trout were exposed to experimental water concentrations of methylmercuric chloride at concentrations from 0.01 to 2.93 ug of Hg/liter, to cadmium chloride from 0.06 to 6.35 ug of Cd/liter, and to lead nitrate from 0.90 to 474 ug of Pb/liter. Exposures were for 2- and 8-week periods. Fish weight and length, hemoglobin, and blood plasma sodium, chloride, glucose, glutamic oxalacetic transaminase, and lactic dehydrogenase were measured. The following observed changes were statistically significant: increases in plasma sodium and chloride and decreases in hemoglobin and glutamic oxalacetic transaminase caused by lead; increases in plasma chloride and lactic dehydrogenase activity and a decrease in plasma

glucose caused by cadmium; and increases in hemoglobin and plasma sodium and chloride caused by methylmercury. Comparisons were made between these biochemical findings and published data from bioassay and tissue-residue studies regarding the determination of threshold indices of toxicity. (EIS-Katz)  
W78-10561

**ZOOTOXICOLOGICAL ESTIMATION OF WASTE ACCOMPANYING THE PRODUCTION OF PHOSPHATES (AQUATIC ENVIRONMENT), (IN POLISH),**  
W. Ogrodowczyk.  
Prace Morskiego Instytutu Rybackiego, Vol 18, Series A, p 7-48, 23 tab, 10 fig, 21 ref. (English and Russian summaries) (1976).

Descriptors: \*Mine wastes, Mineral industry, \*Toxicity, \*Bioassay, Methodology, Water pollution effects, \*Environmental effects, \*Phosphates, Phosphorous, Compounds, Trace elements, Oligochaetes, Hydrogen ion concentration, Water pollution effects, Fertilizers, Gypsum, \*Phosphogypsum, Lumbricus.

The author determined the threshold concentration (C 50%) both for the phosphogypsum as a whole and the analytically separated components which caused fatal shock to test objects in different periods of resorption. The toxicity of a phosphogypsum composed experimentally in the laboratory according to the results of the analysis was also studied. The toxicodynamic characterization of phosphogypsum and its environmental toxicity was worked out on a simplified laboratory model of an aquatic ecosystem with a population of *Lumbriculus variegatus* Muller. The soluble components forming the toxicological complex of Phosphogypsum were identified. (EIS-Katz)  
W78-10562

**A REVIEW OF THE RESTORATION OF STREAM GRAVEL FOR SPAWNING AND REARING OF SALMON SPECIES,**  
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.  
For primary bibliographic entry see Field 5G.  
W78-10563

**EFFECTS OF MARBLE CUTTING AND POLISHING INDUSTRIES WASTEWATER DISPOSAL (WESTERN SICILIAN COAST) ON THE PHYTOBENTHOS COMMUNITIES AND ON THE YIELD OF TUNA FISHING WITH TUNA FISHING TRAPS (IN ITALIAN),**  
A. Gianguzza, M. Sortino, G. Giaccione, and G. Dia.  
Memorie di Biologica Marina e di Oceanografia, N.S. Vol. 6(6), 1976, p 249-276, 7 tab, 4 fig, 16 ref. (English summary).

Descriptors: \*Commercial fish, \*Commercial fisheries, \*Marine fish, \*Mine wastes, Mineral industry, \*Sediments, Benthic algae, Hydrogen ion concentration, Water pollution effects, Turbidity, Industrial wastes, \*Tuna, Tuna fishery, \*Marble cutting, \*Marble polishing, Tuna traps, Western Sicily.

Studies on the effects of marble cutting and polishing industries waste-water disposal (western Sicilian coast) on the phyto-benthos communities and on the yield of tuna fishing with tuna traps are reported. Waste-water disposal has given rise to increased turbidity and perturbations on the sediments rhythm and composition. Sea waters pH values and HCO<sub>3</sub>-CO<sub>3</sub> relation near sludges disposal are changed. Phyto-benthos communities are significantly impaired and changed. Effects on the occurrence, behavior of tunas and on the tuna fishing trends with S. cusumano and Bonagia tuna traps are not in evidence. (EIS-Katz)  
W78-10564

**THE HYDROPSYCHE TOXICITY TEST, TESTED WITH FENETH CARB, DER HYDROPSYCHE-TOXIZITÄTEST, ERPROBT AN FENETHCARB,**  
Landessanstat fuer Umweltschultz (Baden-Wuerttemberg, Karlsruhe (West Germany)).  
For primary bibliographic entry see Field 5A.  
W78-10566

**THE DYNAMICS OF LIPIDS AND DDT IN DEVELOPING BROOK TROUT EGGS AND FRY,**  
Purdue Univ., Lafayette. Dept. of Bionucleonics. G. J. Atchison.  
Journal of Great Lakes Research, Vol. 2(1), p 13-19, 1976, 3 fig, 17 ref.

Descriptors: \*Brook trout, Bioassay, Toxicity, Mortality, \*DDT, \*Fish eggs, \*Juvenile fish, Laboratory tests, \*Radioisotopes, Methodology, Lipids, \*Brook trout eggs, Radioactive carbon, \*Egg yolk.

Adult brook trout, *Salvelinus fontinalis*, were fed p, p'-DDT-3H and linolenic acid-1-14C. Eggs obtained from these fish were fertilized and incubated. The movement of 14C and 3H from the oil droplet and yolk to the embryonic body was followed. The yolk, not the oil droplet, was found to be the main storage site for DDT. Utilization of the triglyceride oil droplet began at hatching. (EIS-Katz)  
W78-10567

**SPORT FISHING AT A THERMAL DISCHARGE INTO LAKE MICHIGAN,**  
Argonne National Lab., IL. Radiological and Environmental Research Div.  
S. A. Spigarelli, and M. M. Thommes.  
Journal of Great Lakes Research Vol. 2(1) p 99-110, 1976 6 tab, 17 ref.

Descriptors: \*Lake Michigan, \*Freshwater fish, \*Trout, \*Salmon, Thermal pollution, \*Thermal powerplants, Thermal water, \*Sport fish, \*Sport fishing, Nuclear power plants, Nuclear reactors, Nuclear wastes, Recreation, \*Point Beach Nuclear Plant, Catch-per-unit-effort, Fishing effort, Total catch, Fishing pressure, Economic value.

Sport fishing censuses were conducted during 1972 and 1973 at the Point Beach Nuclear Plant on Lake Michigan (Two Rivers, Wisconsin). The objectives of this study were to describe the fishery at a typical shoreline thermal discharge into the upper Great Lakes and to make comparisons with reference fisheries in unheated areas. Extensive sport fishing at this power plant resulted in a relatively large catch of trout (4 species) and sporadic catches of salmon and non-salmonid species. Species composition of the catch and catch per-unit-effort varied daily and seasonally and generally reflected trends in reference fisheries. A comparison between years showed increased fishing effort, total catch, and proportion of trout in 1973, while success (catch-per-unit-effort) decreased. Despite this heavy fishing pressure, catch-per-unit-effort was generally higher at Point Beach than in reference shoreline fisheries. The economic value of thermal discharge fisheries on Lake Michigan is estimated using available value and expenditure data. (EIS-Katz)  
W78-10568

**DISTRIBUTION OF MACROBENTHIC SPECIES IN LAKE ONTARIO IN RELATION TO SOURCES OF POLLUTION AND SEDIMENT PARAMETERS,**  
National Field Investigations Center-Cincinnati, OH.  
T. F. Nalepa, and N. A. Thomas.  
Journal of Great Lakes Research Vol. 2(1) p 150-163, 1976, 1 tab, 4 fig, 22 ref.

Descriptors: \*Lake Ontario, Water pollution sources, \*Water pollution effects, \*Sediments, \*Oligochaetes, Amphipods, Eutrophic, Nutrients, \*Benthos, Invertebrates, Sediment distribution, Sands, Silts, \*Pontoporeia affinis, \*Stylodrilus heringianus, \*Limnodrilus hoffmeisteri, Toronto, Niagara River.

Bottom samples were collected in Lake Ontario during the International Field Year for the Great Lakes (IFYGL) in November 1972. Samples were collected in triplicate at 55 stations located throughout the lake. Oligochaetes and the amphipod *Pontoporeia affinis* accounted for 92% of all organisms collected. The former group dominated the shallow areas while the latter dominated the intermediate and deep-water zones. *Stylodrilus heringianus* and *Limnodrilus hoffmeisteri* were the most widely distributed species, being collected at 51 of the 55 stations. The most obviously eutrophic areas were near the mouth of the Niagara River and off Toronto. These areas were characterized by high oligochaete densities dominated by either *L. hoffmeisteri* and *T. tubifex*. Mesotrophic conditions were evident along the southern shoreline from the mouth of the Niagara River to Rochester, New York. *Stylodrilus heringianus*, *L. hoffmeisteri*, *T. tubifex* and *P. affinis* were significantly related to some of the measured sediment parameters in either the intermediate or deep-water areas. (EIS-Katz)  
W78-10569

**HARMFUL EFFECT OF AMMONIA ON GROWTH OF THE BRINE SHRIMP ARTEMIA SALINA AND INHIBITION OF AMMONIA ACCUMULATION WITH AN ALGA CHLORELLA (IN JAPANESE),**  
Kyushu Univ., Fukuoka (Japan). Fisheries Lab. H. Hanaoka.  
Bulletin of Plankton Society of Japan, Vol. 24(2), 1977, p 23-31, 1 tab, 9 fig, 5 ref. (English summary).

Descriptors: \*Aquiculture, \*Ammonia, Ammonium compounds, Bioassay, Toxicity, Growth, Foods, \*Phytoplankton, Zooplankton, \*Brine shrimp, Chlorella, Protein, Fish hatchery, Algae, *Artemia salina*.

More than 100 ug-atms/l of ammonia inhibited food ingestion of the brine shrimp, and kept the food ingestion rate at 1/3-1/2 of the normal rate. Digestibility of food by the brine shrimp also showed a tendency to decrease by the presence of ammonia in the culture water. Adding of Chlorella showed a notable effect to decrease ammonia concentration in the water. Culture of the brine shrimp mixed with Chlorella inhibited accumulation of ammonia and kept it at low level under 50 ug-atm/l. Culture of the brine shrimp with a dry food WAKAMOTO in water containing Chlorella is considered to be a simple and efficient way to keep the growth rate at good levels. (EIS-Katz)  
W78-10570

**CHANGE IN FISH TOXICITY OF LAS DURING BIODEGRADATION, (IN JAPANESE),**  
Lion Fat and Oil Co. Ltd., Tokyo (Japan). K. Oba, T. Sugiyama, K. Miura, and Y. Morisaki.  
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43(8), p 1001-1008, 1977, 3 tab, 11 fig, 15 ref. (English summary).

Descriptors: \*Toxicity, \*Mortality, Bioassay, Water pollution effects, Path of pollutants, Domestic wastes, \*Surfactants, \*Detergents, Degradation(Decomposition), \*Linear alkyl sulfonates, Laboratory equipment, Chemical analysis, Japanese rice fish, *Oryzias*.

In case of evaluating possible effects on fish of lower levels of anionic surfactants present in the natural aquatic environment, the authors thought that it was necessary to examine the effect of LAS on Japanese killifish, *Oryzias latipes*, in a dynamic

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system taking into account molecular change caused by biodegradation. Considering the decrease in surfactant molecules and the changes in the distribution of the homologues and isomers of LAS (linear alkylbenzene sulfate), the influence of LAS in the course of biodegradation on the mortality and hatchability of Japanese killifish was determined using a continuous flow river model. And the results were compared with the case of intact LAS in a static bioassay system. It was shown that biodegraded LAS was less toxic for every stage of killifish in the river model than was intact LAS in the static bioassay. The longer alkyl chain homologues and external phenyl isomers, although more toxic for fish, were more rapidly biodegraded. (EIS-Katz)  
W78-10571

**MONITORING OF THE ACCUMULATION OF ORGANO CHLORINES IN FISH (UBERWACHUNG DER SPEICHERUNG VON CHLORIERTEN KOHLENWASSERSTOFFEN IM FISCH)**, Bundesforschungsanstalt fuer Fischerei, Hamburg (West Germany). Inst. fuer Kuesten- und Binnenfischerei.  
For primary bibliographic entry see Field 5B.  
W78-10572

**MARINE POLLUTION IN SURUGA BAY AND ASSOCIATED ENVIRONMENTAL CHANGE IN RELATION TO FISHERIES (IN JAPANESE)**, M. Uda, T. Nakao, and A. Kishi. Journal of the Faculty of Marine Science and Technology, Tokai University, Vol. 10, p 147-174, 1977. 20 fig, 3 tab, 28 ref. (English summary).

Descriptors: \*Water pollution effects, Commercial fisheries, Industrial wastes, \*Pulp and paper industry, \*Pulp wastes, \*Path of pollutants, Water quality, Aquaculture, Domestic wastes, Monitoring, Marine fish, Marine fisheries, On-site investigation, \*Ocean currents, \*Suruga Bay, Japan, Tagounoura Harbor, Field surveys, \*Kuroshio current.

In order to study the actual state of marine pollution in Suruga Bay due to the effluents of pulp-mill sludge water and other complex industrial wastes together with domestic wastes, surveys were carried out during the years 1971-76 on and around the coasts of the bay. During the years 1971-76 the condition of the fisheries, which had been very badly damaged, have recently been improving with the approach and intrusion of the Kuroshio branch current together with the strict control of industrial and domestic wastes. However, more comprehensive monitoring and management through recycling of waste resources and waste energy utilization is needed for complete protection from marine pollution in Suruga Bay in future, even when the remote-flowing Kuroshio current shifts to a different phase. (EIS-Katz)  
W78-10573

**TEMPERATURE TOLERANCE OF YOUNG ROCKFISH, SEBASTES THOMPSONI (JORDAN ET HUBBS) (IN JAPANESE)**, K. Ouchi. Bulletin of the Japanese Regional Fisheries Research Laboratory, Vol. 28, p 1-8, 1977. 4 tab, 2 fig, 10 ref. (English summary).

Descriptors: \*Marine fish, \*Water temperature, \*Commercial fish, Water pollution effects, Bioassay, Mortality, Fish physiology, \*Stress, Juvenile fish, Perch, Rockfish, Sebastes, \*Upper incipient lethal temperature, \*Ultimate upper lethal temperature, Upper thermal tolerance zone, \*Temperature tolerance.

For young rockfish, *Sebastes thompsoni* (Jordan et Hubbs), acclimated to temperatures between 10 and 25°C, the upper incipient lethal temperature (defined as the temperature at which 50% of fish

die after 24 h) ranged between 25.6 and 28.8°C, and it was observed that the ultimate upper lethal temperature was about 28.6°C. The upper thermal tolerance zones for the fish were 334 degrees Centigrade squared; and the thermal tolerance (sum of upper and lower thermal tolerance zones) was 701 degrees Centigrade squared, being estimated by the Edsall et al.'s regression equation. In comparison of these values of the fish to those of North American fishes, it was revealed that the temperature tolerance of the fish was closely similar to that of *Perca flavescens* (Family Percidae). (EIS-Katz)  
W78-10574

**LOCOMOTOR ACTIVITY OF THE BLUEGILL LEPOMIS MACROCHIRUS: HYPERACTIVITY INDUCED BY SUBLETHAL CONCENTRATIONS OF CADMIUM, CHROMIUM AND ZINC**, Tulane Univ., New Orleans, LA. Dept. of Biology. E. G. Ellgaard, J. E. Tusa, and A. A. Malizia, Jr. Journal of Fish Biology, Vol. 1, p 19-23, 1978. 1 tab, 1 fig, 8 ref.

Descriptors: \*Metals, \*Cadmium, \*Chromium, \*Zinc, Water pollution effects, \*Fish behavior, Fish physiology, Bioassay, Mortality, Laboratory tests, Methodology, Sunfish, Fish pathology, \*Locomotor activity, \*Bluegill sunfish, *Lepomis macrochirus*, \*Sublethal concentrations.

A quantitative description of the effects of sublethal concentrations of cadmium, chromium, and zinc on the swimming activities of the bluegill is presented. Locomotor activities of fish in 0.1 and 0.25 mg l-l cadmium are respectively 1.5 and 7-8 times the activities of control fish. Fish in 0.5 mg l-l cadmium, a concentration killing 30% in two weeks, were less active than controls. Fish in 0.05, 2.4 and 24.0 mg l-l chromium were respectively 1-2, 3-6 and 6-5 times as active as controls. Fish in 0.1 and 5.0 mg l-l zinc were respectively 1.3 and 3.8 times as active as controls. Thus, metals effect hyperactive locomotor responses by the bluegill in a concentration-dependent relationship. (EIS-Katz)  
W78-10575

**FINDING OF A DINOFLAGELLATE AS A LIKELY CULPRIT OF CIGUATERA**, Tohoku Univ., Sendai (Japan). Lab. of Food Hygiene. T. Yasumoto, I. Nakajima, R. Bagnis, and R. Adachi. Bulletin of the Japanese Society of Scientific Fisheries Vol. 43(8), p 1021-1026, 1977. 1 tab, 2 fig, 7 ref.

Descriptors: Chemical analysis, \*Methodology, \*Toxicity, \*Public health, \*Commercial fish, Commercial fisheries, Marine fish, Pacific Ocean, Food chain, \*Toxins, Foods, Marine algae, \*Dinoflagellates, \*Ciguatera, French polynesia, Gambier Islands, Toxicology, *Diplosalis*.

Experiments were designed to see whether a dinoflagellate, *Diplosalis* sp. nov. found in a toxic sample of detritus collected from a ciguatera-endemic area is the cause of ciguatera. The dinoflagellate in the detritus was separated from other materials. Bioassay of the dinoflagellate-rich samples thus obtained proved that the toxicity of each sample was proportionally related to the number of the dinoflagellate cells in the sample. Subsequent extraction of the dinoflagellate sample afforded two major toxins: a diethyl ether soluble toxin and an acetone precipitable toxin. The former toxin was judged to be identical, or closely related, to ciguatera, a major toxin in ciguatera, on the basis of various column and thin layer chromatographic properties. A close similarity was also observed between the acetone precipitable toxin and maitotoxin, a secondary toxin isolated from ciguateric surgeonfish. Judging from these results, it was concluded that *Diplosalis* spp. nov

is very likely to be the cause of ciguatera. (EIS-Katz)  
W78-10576

**A SURVEY OF COMPARATIVE TOXICITY IN THE FOOD CHAIN CIGUATERA**, Tohoku Univ., Sendai (Japan). Lab. of Food Hygiene. T. Yasumoto, R. Bagnis, S. Thevenin, and M. Garcon. Bulletin of the Japanese Society of Scientific Fisheries Vol. 43(8), 1977. p 1015-1019, 3 tab, 7 ref.

Descriptors: \*Toxicity, \*Public health, \*Commercial fish, Commercial fisheries, Pacific Ocean, Food chain, Food habits, \*Food webs, \*Food toxins, Marine fish, Molluscs, Marine algae, Coral, Diseases, Mullet, Dinoflagellates, \*Ciguatera, French polynesia, Gambier Islands, Toxicology.

In order to elucidate the transmission of ciguatera in through the food chain and thus determine the primary source of the toxin, fish and molluscs of various feeding habits were collected from three ciguatera-endemic areas of French Polynesia. The specimens included carnivores, herbivores, surface grazers, coral feeders, sediment feeders, and filter feeders. Despite such diversity in feeding habits, all the fish specimens were more or less toxic by our screening method for ciguatera. The molluscs were nontoxic. Subsequent tests on the diets of these fish disclosed strong toxicity in a sample consisting of algae and detritus collected from the surface of dead coral of the Gambier Islands. Microscopic observation revealed the presence of large number of species of dinoflagellate in this sample. Comparison of similar samples from other places indicated that the dinoflagellate might be the cause of the toxicity. (EIS-Katz)  
W78-10577

**STUDIES ON THE BIOMASS DISTRIBUTION OF AQUATIC MASSES IN THE SELF PURIFYING SECTION OF A BREWERY-WASTE-WATER-POLLUTED STREAM, UNTERSUCHUNGEN ZUR BIOMASSENVERTEILUNG SUBMERSEER BRYOPHYTEN IN DER SELBSTREINIGUNGSTRECKE EINES BRAUEREIABWASSERVORFLUTERS (METTMA, HOCHSCHWARZWALD)**, W. Ostendorf, and E. Schmidt. Gewässer und Abwasser, Vol. 62/63, p 85-96, 1977. 2 tab, 3 fig, 17 ref. (English summary).

Descriptors: \*Water pollution, \*Water pollution effects, Streams, Aquatic algae, Aquatic fungi, Aquatic microorganisms, Self-purification, \*Primary productivity, \*Biomass, Industrial wastes, Biomass distribution, West Germany, \*Brewery-waste-waters, Mountain streams, Aquatic mosses.

In summer 1976 the biomass distribution of aquatic mosses from the self-purifying stretch of a brewery-waste-water polluted mountain stream (Mettma, Black Forest, West Germany) was investigated by determining the ignition loss. It is shown that most of the species are suitable as pollution indicators. In particular the mean degrees of saprobity, with standard deviation, are determined. (EIS-Katz)  
W78-10579

**THE SEA URCHIN EGG AS A TEST OBJECT IN OIL POLLUTION STUDIES**, Tromsø Univ. (Norway). Inst. of Biology and Geology. S. Lønning. Rapports et Proces-Verbaux des Reunions, Conseil International Pour l'Exploration de la Mer, Vol. 171, p. 186-188, 1977. 1 tab, 2 fig, 6 ref.

Descriptors: \*Oil, \*Oil pollution, \*Bioassay, Toxicity, Mortality, Surfactants, Juvenile forms,



Embryonic growth stage, \*Methodology, Laboratory tests, \*Water pollution effects, \*Sea urchin eggs, Strongylocentrotus, Ekofisk oil, \*Sea urchin larvae.

Sea urchin eggs and embryos were used as test material in toxicity studies in regard to oil pollution. It was demonstrated that crude oil has surprisingly modest effects on the development of the embryo, whereas oil dispersants from various manufacturers have more serious influences on development. (EIS-Katz)  
W78-10580

**ALGAL METABOLITES AND FISH KILLS IN A BAYOU ESTUARY: AN ALTERNATIVE EXPLANATION TO THE LOW DISSOLVED OXYGEN CONTROVERSY.**  
University of West Florida, Pensacola. Faculty of Biology.

G. A. Moshiri, W. G. Crumpton, and D. A. Blaylock.  
Journal of the Water Pollution Control Federation, Vol. 50(8), 1978. p 2043-2046. 3 fig, 5 ref.

Descriptors: \*Fishkills, \*Mortalities, \*Dinoflagellates, \*Toxins, Florida, \*Dissolved oxygen, Eutrophication, \*Algal poisoning, Algal toxins, Phytoplankton, \*Gymnodinium, \*Bayou Texar, Pensacola, Florida.

Massive fish kills in the eutrophic Bayou Texar, Pensacola, Florida, might be due to toxins from algal blooms rather than dissolved oxygen deficiency. (EIS-Katz)  
W78-10582

**DUCK MORTALITY FROM DETERGENT-POLLUTED WATER.**  
Army Dugway Proving Ground, UT. Environmental and Life Sciences Div.  
G. L. Choules, W. C. Russell, and D. A. Gauthier.  
Journal of Wildlife Management, Vol. 42(2), 1978. p 410-414. 4 tab, 1 fig, 14 ref.

Descriptors: Colorado, \*Mortality, On-site investigation, \*Detergents, Surfactants, Industrial wastes, \*Ducks(Wild), \*Water birds, Water pollution effects, \*Animal physiology, Animal behavior, Aldrin, Dieldrin, Mercury, Cadmium, Lead, Arsenic compounds, \*Rocky Mountain Arsenal, Selenium.

The deaths of waterfowl, following exposure to polluted industrial waste water seemed to result from chilling by detergent wetting. Both in the laboratory and in the field swimming birds were observed to become increasingly wetted until two thirds to three fourths of their bodies were submerged. (EIS-Katz)  
W78-10583

**PETROLEUM: EFFECTS ON MALLARD EGG HATCHABILITY.**  
Fish and Wildlife Service, Laurel, MD. Patuxent Wildlife Research Center.  
R. C. Szara, P. H. Albers, and N. C. Coon.  
Journal of Wildlife Management, Vol. 42(2), 1978. p. 404-406. 2 tab, 7 ref.

Descriptors: \*Oil, \*Oil pollution, Bioassay, \*Mortality, Toxicity, \*Ducks(Wild), Water birds, Animal physiology, Laboratory tests, Methodology, Water pollution effects, Animal behavior, \*Mallard ducks, \*Kuwait crude oil, \*South Louisiana crude oil, \*No. 2 diesel.

In laboratory tests, the effects were determined of 2 crude oils (Southern Louisiana and Kuwait) and a refined oil (No. 2 fuel oil) on the survival of mallard embryos hatched from eggs that were exposed to oil on the eighth day of incubation. Ninety six hour survival and hatchability after 30 days incubation were significantly reduced in all oil treatment groups. (EIS-Katz)  
W78-10584

**THE BACTERIAL PATHOGEN FLEXIBACTER COLUMNARIS AND ITS EPIZOOTIOLOGY AMONG COLUMBIA RIVER FISH, A REVIEW AND SYNTHESIS.**  
Battelle Pacific Northwest Labs., Richland, WA.  
C. D. Becker, and M. P. Fujiwara.  
American Fisheries Society, Washington, D.C., Monograph No. 2, 1978. 92 p, 39 tab, 25 fig, 132 ref.

Descriptors: \*Fish diseases, Fish pathology, \*Chinook salmon, \*Columbia River, Freshwater fish, \*Hydroelectric plants, Hydroelectric power, Dams, Reservoirs, \*Water temperature, Nuclear energy, \*Nuclear powerplants, Nuclear reactors, Water temperature, \*Thermal effects, \*Microorganisms, On-site investigations.

A review and synthesis was made of the studies conducted on columnaris disease, caused by the bacterium Flexibacter columnaris among resident and anadromous fish of the Columbia River. High virulence strains capable of causing extensive mortalities among adult salmonids were observed in the 1950's. There was concern that the operation of a plutonium plant complex at Hanford might influence disease epizootiology. No incidence of the effect of the Hanford works was indicated. The dominant role may be attributed to environmental modifications associated with hydroelectric development of the Columbia River. (EIS-Katz)  
W78-10585

**THE IMPACT OF HUMAN TRAMPLING ON PHOSPHORUS LOADING TO A SMALL LAKE IN GATINEAU PARK, QUEBEC, CANADA.**  
Brock Univ., St. Catharines (Ontario). Dept of Biological Sciences.  
M. Dickman, and M. Dorais.  
Journal of Environmental Management, Vol 5, No 4, p 335-344, October 1977. 5 fig, 1 tab, 5 plates, 17 ref.

Descriptors: \*Environmental effects, \*Lakes, \*Phosphorus, \*Eutrophication, \*Visitor density, Recreation, Sampling, Water quality, Summer, Phytoplankton, Gatineau Park(Quebec).

A ten-fold increase in the annual number of visitors to Pinks Lake, Quebec has occurred over the last two decades, and the subsequent increase in trampling within its steep-sided basin has resulted in a significant reduction in plant cover. This has aggravated the erosion problem in the lake's basin, resulting in abnormally high phosphorus loading to the lake. Thirty-eight samples of recently eroded material taken from randomized sites along the lake shore contained 161 g leachable phosphorus per square metre. Secchi transparency in Pinks Lake decreased from an estimated 5.8 m in 1956 to 3.6 m in 1976. During the same period, visitor density at Pinks Lake increased by an order of magnitude from roughly 400 visitors per year in 1956 to over 4000 per year in 1976. Changes in summer phytoplankton species composition have also occurred. At present, diatoms and small phytoflagellates dominate in spring, while blue green algae and dinoflagellates become abundant in fall. It is felt that this is the first published account of a causal link between human trampling and lake eutrophication which can be substantiated from an annual phosphorus budget analysis. A phosphorus loading of 854 mg/sq m of lake surface places this lake among the more eutrophic lakes of North America. This is all the more unusual since the lake receives no municipal, agricultural or rural effluent discharge due to its location in a semiwilderness area within Canada's National Capital Region. The impact of human trampling, therefore, is of overriding significance to the management of this sensitive area. (Bell-Cornell)  
W78-10653

**WATER QUALITY OF NORMAL AND STORM-INDUCED SURFACE WATER RUNOFF:**

**KANE'OHE BAY WATERSHED OAHU, HAWAII FEBRUARY 1974 TO MARCH 1975,**  
Hawaii Univ., Honolulu.  
G. L. Dugan.  
Technical Report No. 106. Water Resources Research Center, and HESL Technical Report No. 7, Hawaii Environmental Simulation Laboratory, University of Hawaii, Honolulu, February 1977. Cooperative Report. 74 p, 18 fig, 19 tab, 21 ref, 1 append.

Descriptors: \*Hawaii, \*Simulation analysis, \*Environmental effects, \*Water quality, \*Sampling, \*Streams, \*Watersheds(Basins), Drainage, Land use, Runoff, Programs, Methodology, Mathematical models, Systems analysis.

The Hawaii environmental Simulation Laboratory (HESL), since its establishment in the spring of 1971, has attempted to simulate some of the consequences of alternative land-use economic decisions which include, as one of its major parameters, the effects of proposed land-use changes on the quantity and quality of water within the watershed and its succeeding watershed(s) and/or receiving water. The scope of this report, which encompasses stream water quality monitoring under both normal and storm-induced conditions within drainage areas that are subjected to different land management practices is based primarily on a 12-month routine water quality sampling and analysis program by HESL for five stream sites in the Kaneohe Bay watershed, and a companion storm-induced stream water runoff 5-month winter sampling program at one of the stream sites. In general, study results indicate that: the constituent concentrations were related to flow rather than to the time phase of the storm (stream) runoff; the sediment and particulate carbon, nitrogen, and phosphorus increased directly with flow; and the influence of the quality of the rain became greater with increased flow, as evidenced in reduced concentrations of silica dioxide, conductivity, and nitrite and nitrate nitrogen. Dissolved organic and ammonium nitrogen and dissolved organic and phosphate phosphorus tended to decrease slightly, but in general did not present an apparent particular pattern. By using HESL investigations and technique developments, a planner-decision maker should have valuable tools for compiling adequate data for predicting water quality and quantity changes due to determinations of land-use alterations. (Bell-Cornell)  
W78-10665

**SUSPENDED SEDIMENT IN THE CHESAPEAKE AND DELAWARE CANAL,**  
State Univ. of New York at Stony Brook. Marine Sciences Research Center.  
For primary bibliographic entry see Field 5B.  
W78-10666

**EFFECT OF PH ON BIOASSAYS IN FRESH AND SEAWATER.**  
British Columbia Research Council, Vancouver.  
D. J. McLeay.  
Canadian Forestry Service, Ottawa, Ontario K1A OH3. Cooperative Pollution Abatement Research (CPAR) Project Report 402-1, Final Report to March 31, 1976, 86 p, 10 fig, 43 ref, 24 tab.

Descriptors: \*Pulp wastes, \*Hydrogen ion concentration, \*Bioassay, Freshwater, Seawater, Pulp and paper industry, Wastes, Industrial wastes, Water pollution sources, Toxicity, Fish, Rainbow trout, Lethal limit, Water pollution effects, Aquatic life, Water quality, Resin acids.

The acute toxicity of bleached draft mill effluent (BKME) to fish is the same in seawater of freshwater as diluent, provided the pH of bioassay solutions is adjusted to the same value. Fish which adapted too rapidly to seawater were less tolerant to BKME in seawater bioassays. At pH 7.5 (the

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pH of seawater diluent) BKME was less toxic than at pH 6.4-6.5 (the pH of freshwater diluent) in either seawater or freshwater bioassays. In freshwater bioassays of 5 BKME and one unbleached kraft effluent (with pH controlled at values between 4 and 11), the least toxic pH range to rainbow trout was 8.5-9.5, with upper and lower lethal limits of ca. 10.0 and 4.0. Using ten natural freshwaters as diluent, the observed differences in acute toxicity could be largely eliminated by adjusting the test solution pH to a common value. Remaining minor differences appeared to be associated with ionizable inorganic constituents of the dilution waters. The pH/toxicity relationship for pulp mill effluents was attributed mainly to the effect of pH on the ionization of their resin acid constituents. Monitoring and regulatory bioassays for determining inherent toxicities of pulp mill effluents from both coastal and interior mills should use rainbow trout in freshwater bioassays with test solutions adjusted to pH 7.5. Problems associated with the pH of mill discharges should be dealt with separately. (Brown-IPC)  
W78-10680

**SEWAGE COULD SPREAD HEALTH HAZARD.**  
For primary bibliographic entry see Field 5E.  
W78-10728

**ON THE BENTHIC FAUNA OF SOME RIVER SYSTEMS IN THE NAGASAKI DISTRICT (1) THE SASU AND THE SE RIVERS OF TSUSHIMA IN WINTER (IN JAPANESE).**  
Nagasaki Inst. of Health Science and Environmental Science (Japan).  
Y. Machida, and S. Ishizaki.  
Japanese Journal of Limnology, Vol. 36, p 122-130, 1975. 2 fig, 5 tab, 10 ref. (English summary).

Descriptors: \*Zinc, Mining industry, \*Mining wastes, \*Copper, \*Zinc, \*Lead, \*Cadmium, Industrial wastes, \*Benthic fauna, Benthos, Water pollution effects, Metals, \*Aquatic insects, Environmental effects, Animal populations, \*Japan, Nagasaki District, \*Zinc mine, \*Abandoned mines, River Sasu, River Se, Diversity index.

The benthic communities of two river systems in the Tsushima Islands were investigated to evaluate biologically the change of environmental conditions. Twelve sampling stations were in the River Sasu and seven in the River Se. The dominant species at the unpolluted stations in the Sasu was *Simulium japonicum* and *Ephemera* sp.; the subdominant species were *Chironomidae* and *Antocha* sp. At St. 9 only seven species were recognized and the values of three different diversity indexes were significantly low. For the River Se, more than twenty species were recognized at all the stations, neither *Chironomidae* nor *Antocha* sp. being dominant. The values of diversity indexes at the stations were *Epeorus latifolium* dominated were comparatively lower than at the other stations. These results show that the heavy metals such as Cu, Zn, Pb or Cd contained in the effluent of the zinc mine affect the benthic communities of the river, especially the abundance of their components. (Katz-EIS)  
W78-10736

**POLYCHLORINATED 2-AMINODIPHENYL ETHERS IN FISH.**  
Karolinska Inst., Stockholm (Sweden). Dept. of Chemistry.  
G. Westoo, and K. Noren.  
Ambio, Vol. 6, No 4, p 232-234, 1977, 3 fig, 1 tab, 12 ref.

Descriptors: \*Freshwater fish, \*Dieldrin, Industrial wastes, Water pollution effects, Path of pollutants, Public health, \*Gas chromatography, Spectroscopy, Chlorinated hydrocarbon pesticides, Chemical analysis, \*Textiles, \*Polychlorinated biphenyls, River Viskan, Polychlorinated 2-aminodiphenyl ethers, \*Mothproofing agent,

Eulan WA Neu, 2,3,4,5-pentachloro-2-aminodiphenyl ether, 2,3,4,4,5,6 hexachloro-2-aminodiphenyl ether.

The flesh of fish caught downstream from factories using the mothproofing agent Eulan WA Neu contained the fat-soluble compounds 2',3,4,4',5-pentachloro-2-aminodiphenyl ether and 2',3,4,4',5,6-hexachloro-2-aminodiphenyl ether. These substances were also found as impurities in Eulan WA Neu. Larger amounts of the two ethers could be prepared by hydrolysis of the main active substances of Eulan WA Neu. (Katz-EIS)  
W78-10737

**MICROBIAL DEGRADATION OF EKOFISK OIL IN SEAWATER BY SACCHAROMYCOPSIS LIPOLYTICA.**  
Statens Inst. for Folkehelse, Oslo (Norway).  
F. C. Stormer, and A. Vinsjansen.  
Ambio, Vol. 5, No. 3, p 141-142, 1976. 3 fig, 10 ref.

Descriptors: Marine fungi, Marine microorganisms, \*Marine bacteria, \*Oil, \*Oil spills, Water pollution effects, \*Degradation (Decomposition), Hydrogen ion concentration, Bioassay, Laboratory tests, Methodology, \*Yeasts, Seawater, Water temperature, \*Microbial degradation, \*Ekofisk oil, *Saccharomycopsis lipolytica*.

The yeast *Saccharomycopsis lipolytica* was grown in seawater with Ekofisk oil as the carbon source, and the pH was kept constant by the automatic addition of NaOH. The experiments were performed at 8°C and 20°C, respectively. In addition, the yeast was grown at 20°C without pH control. The results indicated that the end products of biodegradation were similar in the experiments and that the oil was dispersed through the microbial activity. (Katz-EIS)  
W78-10738

**ACUTE EFFECTS OF OIL AND OIL/DISPERSANT MIXTURE ON LARVAE OF BALTIC HERRING.**  
Swedish Water and Air Pollution Lab., Nyköping. Baltic Sea Lab.  
O. Lindén.  
Ambio Vol 4, No 3, p 130-133, 1975. 5 fig, 11 ref.

Descriptors: \*Herring, Oil, Oil spills, Water pollution effects, \*Surfactants, Detergents, Methodology, \*Bioassay, Toxicity, Mortality, Juvenile fish, Marine fish, Dispersion, Waste disposal, Fish behavior, \*Baltic herring, \*Crude oil, \*Oil dispersant.

The acute toxic effects of a crude oil, either alone or dispersed by two commonly used oil spill dispersants, were tested on newly hatched herring larvae. The results show that if the oil is dispersed with a dispersant, the toxicity increases 50 to 100 times compared to the oil without the dispersant. A natural oil dispersion without the dispersant loses much of its toxicity in 24 and 72 h. If, however, the oil is dispersed by a dispersant, the high toxicity remains almost unchanged in the same time. (Katz-EIS)  
W78-10740

**EFFECTS OF ACID PRECIPITATION ON MACROPHYTES IN OLIGOTROPHIC SWEDISH LAKES.**  
Swedish Water and Air Pollution Research Lab., Gothenburg.  
H. Hultberg, and O. Grahn.  
In: Proceedings of First Speciality Symposium on Atmospheric Contribution to the Chemistry of Lake Waters. International Association of Great Lakes Research, September 28-October 1, 1975. J. of Great Lakes Research, Vol 2, Supplement 1, p. 208-217, 1976. 10 fig, 21 ref.

Descriptors: \*Lakes, \*Hydrogen Ion Concentrations, \*Oligotrophy, Acidic water, Acidity, Water

pollution effects, Acid streams, Aquatic environment, Aquatic plants, \*Aquatic productivity, Aquatic weeds, Air pollution, Air pollution effects, Lake sediments, Lake stages, \*Acid precipitation, Swedish Lakes, Sphagnum, Macrophytes, \*Sweden.

Among the effects of acidification on rooted macrophytes in the investigated lakes, the indirect ones are of major importance. The isoetes are overgrown and these species suffer seriously from acidification. Among other rooted macrophytes, *Juncus bulbosus* var. *fluitans* increase as a result of increasing organic content in the sediments. The most striking effect on macrophytes is the development of peat moss *Sphagnum* as a submergent rather than terrestrial plant in the lakes. Mats of *Sphagnum* have been observed in several acidified lakes, not only in Sweden but also in Norway. The lakes change from being a kind of 'equilibrium systems' to biologically accumulating systems similar to acid biogenic peat and forest soils. This type of biologically accumulating system causes an oligotrophication and accelerates the acidification process, which in turn leads to further disorders in the lake ecosystem. (Katz-EIS)  
W78-10742

**CADMIUM IN PORT PHILLIP BAY MUSSELS.**  
La Trobe Univ., Bundoora (Australia) Dept. of Inorganic and Analytical Chemistry.  
For primary bibliographic entry see Field 5B.  
W78-10743

**BIOASSAY DATA FOR MARINE POLLUTION USING SEA URCHIN EGGS, 1974.**  
Seto Marine Biological Lab. (Japan).  
For primary bibliographic entry see Field 5A.  
W78-10744

**DEMONSTRATION OF POLLUTION EFFECTS IN AQUATIC MICROCOSMS.**  
Washington Univ., Seattle. Coll. of Fisheries.  
F. B. Taub.  
International Journal of Environmental Studies, Vol 10, p 23-33, 1976. 5 fig, 2 tab, 12 ref.

Descriptors: \*Herbicide, \*Insecticide, \*Mercury, \*Cadmium, Aroclor, \*Polychlorinated biphenyls, Bioassay, Laboratory tests, \*Algae, Zooplankton, DDT, Nutrients, Nitrates, Phosphates, Algalicides, Water pollution effects, Herbivore, *Daphnia*, Methodology, Eutrophication, \*Aquatic microcosms.

Trophic level interactions caused by an algalicide, an insecticide, and two levels of organic enrichment were demonstrated in alga-grazer-bacteria microcosms; e.g., the insecticide caused an algal bloom by removing grazers. The technique was expanded to develop unbiased bioassay of the effects of low levels of HgCl<sub>2</sub>, CdCl<sub>2</sub>, Toxaphene, and Aroclor (PCB) 1242. Problems of toxicant recovery, solvent effects, repeatability, and statistical analyses were uncovered. In an algal chemostat, Aroclor 1242 generally prevented the maintenance of steady state densities. (Katz-EIS)  
W78-10745

**THE ACCUMULATION OF RADIOACTIVE CAESIUM FROM WATER BY THE BROWN TROUT (SALMO TRUTTA) AND ITS COMPARISON WITH PLACE AND RAYS.**  
Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological Lab.  
For primary bibliographic entry see Field 5B.  
W78-10749

**GAS CHROMATOGRAPHIC ANALYSIS OF BERYLLIUM IN THE MARINE SYSTEM. INTERFERENCE, EFFICIENCY, APPARENT**

## BIOLOGICAL DISCRIMINATION AND SOME RESULTS

Alaska Univ., College. Inst. of Marine Science.  
For primary bibliographic entry see Field 5A.  
W78-10750

**EGG SHELL CHARACTERISTICS AND INCIDENCE OF SHELL BREAKAGE FOR GREY HERONS ARDEA CINEREA EXPOSED TO ENVIRONMENTAL POLLUTANTS.**  
Institute of Terrestrial Ecology, Huntingdon (England). Monks Wood Experimental Station.  
A. S. Cooke, A. A. Bell, and I. Presti.  
Environmental Pollution, Vol. 11, p 59-84. 1976. 11 fig, 5 tab, 41 ref.

Descriptors: \*Water birds, Water pollution effects, Animal physiology, Animal behavior, \*Eggs, \*DDT, \*DDE, \*Dieldrin, Path of pollutants, Growth, Pesticides, Environmental effects, \*Egg shell characteristics, Shell breakage, \*Grey herons, England, Ardea cinerea, Shell thickness, Thickness index, Egg residues.

Egg shell characteristics and incidences of shell breakage have been studied for the grey heron Ardea cinerea at several colonies in eastern England. Eggs collected in the late 1960s and in the 1970s had shells which were significantly thinner than shells collected before 1946. For a sample taken in 1973, shell thickness, shell strength, mammillary layer thickness and palisade layer thickness were all inversely related to the concentration of pp'-DDE (+ pp'-DDT + pp'-TDE) in the egg contents. Shell thinning was considered to be due to a reduced availability of shell components leading to a depressed rate of shell formation. A separate mechanism resulted in increased mammillae height relative to mammillary layer thickness. Incidence of egg shell breakage was positively related to the residue levels of pp'-DDE or dieldrin in intact eggs. Eggs with shells thinner than 240 µm were unlikely to survive incubation. Since such eggs tend to contain higher-than-average residues, sampling intact eggs leads to a mean egg residue figure that is lower than the real mean for the colony. Measuring shell thickness is suggested as a rapid and economical bioassay for DDE levels. (Katz-EIS)  
W78-10751

**CONSERVATION PROBLEMS IN THE NORFOLK BROADS AND RIVERS OF EAST ANGLIA, ENGLAND-PHYTOPLANKTON, BOATS AND THE CAUSES OF TURBIDITY.**  
University of East Anglia, Norwich (England). School of Environmental Sciences.  
B. Moss.  
Biological Conservation, Vol. 12, p 95-114. 1977. 35 ref.

Descriptors: \*Turbidity, \*Nutrients, \*Phytoplankton, Rivers, Recreation demand, Recreation wastes, Sediments, \*Turbidity, Boats, Boating, Water pollution effects, Aquatic plants, Methodology, \*England(Norfolk Broad), East Anglia, Macrophytes, \*Sediment disturbance, Nutrient loads, Boat activity.

The Norfolk Broad and rivers of eastern England comprise an area historically famed for the diversity of its wildlife and submerged aquatic plant communities. The latter have progressively disappeared since the early 1950s, until only four sites remain. Increases in turbidity of the water have been associated with the loss of macrophytes, and these increases have been attributed to phytoplankton and to disturbance of sediment by the many boats of visiting tourists and residents. The differential distribution of phytoplankton is discussed in terms of the nutrient loading on, and flushing coefficients of the waterway. Highly significant correlations were obtained between phytoplankton numbers and turbidity in the system as a whole and in Broad and rivers considered separately. A very weak correlation

between boat activity and turbidity was shown to be non-causative. Increase in turbidity is a function of increased nutrient loading from human activities in the catchment area. Boat disturbance does not contribute significantly to the sustained turbidity. (Katz-EIS)  
W78-10752

**HEAVY METAL TOXICITY AND SYNERGISM TO NATURAL PHYTOPLANKTON IN THE EUTROPHIC ALPNACHERSEE AND THE MESOTROPHIC HORW BAY (IN GERMAN).**  
Eidgenössische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewässerschutz, Zurich (Switzerland).  
R. Gachter.

Schweizerische Zeitschrift für Hydrologie Vol. 38, No. 2, p 97-119, 1976. 11 fig, 6 tab, 37 ref, English summary.

Descriptors: \*Phytoplankton, \*Toxicity, Bioassay, Metals, \*Mercury, \*Copper, \*Cadmium, \*Zinc, \*Lead, Water pollution effects, Path of pollutants, Aquatic pollution effects, Path of pollutants, Aquatic algae, \*Primary productivity, Calcium, Hydrogen ion concentration, Photosynthesis, \*Phytoplankton density, Dissolved organic nitrogen, Allochthonous debris, \*Switzerland(Alpnachersee), Horw Bay.

The effects on phytoplankton and photosynthesis of inorganic metal salts HgCl<sub>2</sub>, CuSO<sub>4</sub>, Cd(NO<sub>3</sub>)<sub>2</sub>, ZnCl<sub>2</sub> and Pb(NO<sub>3</sub>)<sub>2</sub> were studied over monthly intervals. In experiments with individual metals, phytoplankton photosynthesis was not adversely affected if background levels did not exceed 10-9 mole Hg/l, 5.10-9 mole Cu/l, 2.10-8 mole Cd/l, 5.10-8 mole Zn/l and 2.10-7 mole Pb/l, respectively. However, when the concentration was increased by 5.10-10 mole Hg/l + 5.10-9 mole Cu/l + 5.10-9 mole Cd/l + 5.10-8 mole Zn/l + 5.10-8 mole Pb/l photosynthesis was significantly reduced, due to a synergistic effect of the combined metals. The influence of phytoplankton density, pH-value, concentration of calcium, dissolved organic nitrogen and allochthonous debris on heavy metal toxicity was investigated. Changes in phytoplankton composition are believed to be the main reason for the seasonal variation in the toxic effects of heavy metals. (Katz-EIS)  
W78-10753

**BIOLOGICAL AND CHEMICAL SUCCESSION IN NAHAL SOREQ: A FREE-FLOWING WASTEWATER STREAM.**  
Hebrew Univ., Jerusalem (Israel). Environmental Health Lab.  
I. Dor, H. Schechter, and H. I. Shuval.  
The Journal of Applied Ecology, Vol. 13, No. 2, p 475-489, 1976. 8 fig, 3 tab, 10 ref.

Descriptors: \*Sewerage, Sewage treatment, Sewage disposal, \*Sewage bacteria, Biochemical oxygen demand, \*Self purification, \*Algae, Oxygen, Photosynthesis, Benthos, \*Invertebrates, Virus, Water pollution, Water pollution effects, \*Eutrophication, \*Environmental gradient, Water temperature, Evaporation, Seepage, \*Jerusalem, Israel, \*Nahal Soreq.

Nahal Soreq is a dry river bed, into which the raw domestic sewage of Jerusalem is discharged. Self-purification processes, undisturbed by dilution or additional load, may therefore be observed in their model form. Compared with most industrialized countries, the sewage of Jerusalem is highly concentrated (BOD<sub>5</sub> of 500-900 ppm) due to low per capita water use and offers a richer substrate for bacterial decomposition. High average temperatures and abundant radiant energy throughout the year promote a high rate of metabolic processes, while the long subtropical dry season, which lasts for some seven to eight months, results in stability of the system. The following aspects of the self-purification occurring in Nahal Soreq have been investigated during the past few years: succes-

sional, physical and chemical changes; rate of disappearance of the enteric bacteria and viruses; oxygen relationships; systematics of the algae and macroinvertebrates; zonation of their communities and growth rate of the epibenthic biomass. In a parallel hydrological study, discharge, flow current velocity, detention time, losses by evaporation and infiltration to the ground water and contributions from the springs and precipitation were evaluated. (Katz-EIS)  
W78-10754

**THE EFFECT OF HEXACHLORANE (HEXACHLOROCYCLOHEXANE (HCH) AND CHLOROPHOS ON UNDERYEARLINGS OF THE LEAPING GRAY MULLET MUGIL SALIENS.**  
F. S. Zambiriborshch, and B. Lay.  
Journal of Ichthyology, Vol. 16, No 5, p 841-847, 1976. 5 tab, 15 ref. (translated from Russian).

Descriptors: \*Chlorinated hydrocarbon insecticides, \*Bioassay, \*Toxicity, Mortality, Laboratory tests, \*Mullet, Fish behavior, Water pollution effects, Dissolved oxygen, Fish physiology, Fish behavior, Juvenile fish, Marine fish, Leaping gray mullet, Mugil saliens, \*Hexachlorane, \*Chlorophos, Survival time, Oxygen consumption.

The influence of hexachlorane and chlorophos on the young of the leaping gray mullet, Mugil saliens, was examined. Hexachlorane in a concentration considerably below the maximum permissible concentration and chlorophos only slightly above the maximum permissible concentration are toxic for these fish. The equations of regression, reflecting the correlational dependence between pesticide concentrations and the length of survival of test fishes, are given. Hexachlorane and chlorophos in concentrations close to the permissible maximum concentration depress fish. In fish poisoned by these pesticides, normal breathing is not restored. (Katz-EIS)  
W78-10817

**THE REACTIONS OF SOME BLACK SEA ORGANISMS IN AN ELECTRIC FIELD EXPOSED TO DISSOLVED PETROLEUM PRODUCTS.**  
L. A. Balayev, N. D. Mazmanidi, and T. R. Bazhashvili.  
Journal of Ichthyology, Vol. 16, No 4, p 647-652, 1976. 6 tab. (translated from the Russian).

Descriptors: \*Oil, \*Oil pollution, \*Bioassay, Laboratory tests, Water pollution effects, Toxicity, Mortality, \*Fish behavior, \*Animal behavior, Marine fish, Shrimp, Methodology, Fish physiology, Juvenile growth stages, \*Black Sea, Pelagic fish, \*Flounder larvae, \*Electric field.

On the basis of a study of three responses (primary, anode, electric shock) of some Black Sea organisms in an electric field exposed to dissolved petroleum products, it was established that they are all to some extent sensitive to such poisoning and that in fishes the degree of sensitivity is related to ecological groupings. (Katz-EIS)  
W78-10818

**IMPACT OF FLUID MUD DREDGED MATERIAL ON BENTHIC COMMUNITIES OF THE TIDAL JAMES RIVER, VIRGINIA.**  
Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography.  
R. J. Diaz, and D. F. Boesch.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 915. Price codes: A05 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-45, December 1977. 75 p, 13 tab, 6 fig, 36 ref, 2 append.



## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects Of Pollution

Descriptors: \*Benthic fauna, \*Benthos, \*Mud, Water pollution effects, Virginia, \*James River(Va), \*Dredged material disposal, \*Fluid mud.

The unconfined open-water disposal resulting from the maintenance dredging of the Jordan Point - Windmill Point channel had an acute impact on the macrobenthic community. The fluid mud produced from the disposal operation probably had both physical and physiological effects on the fauna. Responses varied by species. Insects were the most sensitive and oligochaetes the least affected. Due to the resilience and opportunistic nature of the fauna the detectable impacts lasted less than 3 months. Fluid mud produced from disposal of fine-grained dredged material has properties and effects different than natural sediments. Its low density, instability and low oxygen concentration present severe problems of support, respiration, and feeding of benthic organisms. (WES) W78-10944

**MODELING OF ECOLOGICAL SUCCESSION AND PRODUCTION IN ESTUARINE MARSHES,** Virginia Univ., Charlottesville. Dept. of Environmental Sciences. For primary bibliographic entry see Field 2L. W78-10945

**TRACE AND TOXIC METAL UPTAKE BY MARSH PLANTS AS AFFECTED BY EH, PH, AND SALINITY.** Louisiana State Univ., Baton Rouge. Center for Wetland Resources. Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 914. Price codes: A07 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-40, December 1977. 141 p, 58 tab, 75 ref, 1 fig.

Descriptors: \*Metals, Trace metals, \*Marsh plants, \*Trace elements, Soil chemistry, Waste disposal, Salinity, \*Absorption, Hydrogen ion concentration, \*Dredged material disposal, Oxidation-reduction potential, Water pollution effects.

A laboratory study was conducted to develop and refine methods for growing marsh plants under conditions of controlled pH, redox potential (oxidation-reduction conditions) and salinity as well as to determine the effects of these physicochemical conditions in the rooting medium on trace and toxic metal availability to plants. Reasonably successful methods were developed for growing marsh plants in the experimental systems. The successful methods as well as procedures which were not successful are discussed as are techniques for overcoming many of the experimental difficulties. Two extractants were used on the soil suspensions following harvest to determine the linear relationships between chemical availability and plant content of metals in laboratory studies. Of the metals studied, cadmium generally gave the best linear association between measured uptake and chemical availability, although there were important species differences. Based on the results of this research, it was concluded that soil and sediment physicochemical conditions do affect the plant availability of trace and toxic metals, and it was recommended that these effects should be considered in selecting environmentally sound disposal methods for contaminated dredged sediments. (WES) W78-10949

**ENHANCEMENT OF RELEASES FROM A STRATIFIED IMPOUNDMENT BY LOCALIZED MIXING, OKATIBBEE LAKE, MISSISSIPPI,** Army Engineer Waterways Experiment Station, Vicksburg, MS. For primary bibliographic entry see Field 5G.

W78-10950

**COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME I: PRODUCTIVITY,** Louisiana State Univ., Baton Rouge. J. G. Gosselink, C. S. Hopkinson, Jr., and R. T. Parrondo.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 094. Price codes: A08 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-44, December 1977 (In 2 volumes). 132 p, 2 tab, 7 fig, 20 ref, 3 append.

Descriptors: \*Coastal marshes, \*Marsh plants, \*Productivity, Waste disposal, \*Gulf Coast, Water pollution effects.

The study reports on the productivity of seven marsh plant species in coastal marshes of Louisiana. The Wiegert-Evans harvest technique was used to measure productivity over a two-year period of the following species: *Distichlis spicata* (salt grass), *Juncus roemerianus* (black rush), *Phragmites communis* (common reed), *Spartina alterniflora* (saltmarsh cordgrass), *Spartina patens* (saltmeadow cordgrass), and *Sagittaria falcata* (bulltongue). Productivity was found to be related to the growth habit and turnover rate. *S. patens*, *J. roemerianus*, and *D. spicata* were found to be more productive than *S. alterniflora*, a species that was known to be highly productive. Productivity was higher in the fresh and brackish marsh species than in the salt marsh species and was higher for species that grow throughout the winter than those that die to the ground in late fall. An evaluation was also made of several techniques for measuring productivity, including harvest, phenometric, and gasometric methods. The study showed that peak standing crop seriously underestimates production in Gulf Coast marshes and that the Wiegert-Evans harvest technique is the most realistic method presently available. (See also W78-10953) W78-10952

**COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME II: GROWTH DYNAMICS,** Louisiana State Univ., Baton Rouge.

J. G. Gosselink, C. S. Hopkinson, Jr., and R. T. Parrondo. Available from the National Technical Information Service, Springfield, VA 22161 as AD-A052 095. Price codes: A09 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-44, December 1977 (In 2 volumes). 202 p, 25 ref, 3 tab, 15 fig, 7 append.

Descriptors: \*Marsh plants, \*Coastal marshes, \*Salt marshes, \*Plant growth, Physiological ecology, \*Gulf Coast, Water pollution effects, Waste disposal.

As part of the U. S. Army Corps of Engineers Dredged Material Research Program, administered by the Environmental Effects Laboratory of the U. S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, a study of the growth physiology of marsh plants common to the Gulf Coast area was conducted. The growth physiology study, concerned with the physiological ecology of stress, reports on several experiments on the ability of marsh plants to survive, particularly under stresses of salinity and inundation. Although several species are investigated, including *Distichlis spicata*, *Juncus roemerianus*, *Phragmites communis*, *Sagittaria falcata*, *Spartina cynosuroides*, and *Spartina patens*, major emphasis is given to the adaptability and ecophysiological requirements of *Spartina alterniflora*: the response of this species is contrasted with that of the other species. Emphasis is given to the substrate qualities to which *Spartina alterniflora* can adapt and to the

adaptation mechanisms. Results of the studies are integrated in a general conceptual model that has application to the development of marshes on dredged material. (See also W78-10952) (WES) W78-10953

**HABITAT DEVELOPMENT FIELD INVESTIGATIONS, WINDMILL POINT MARSH DEVELOPMENT SITE, JAMES RIVER, VIRGINIA; APPENDIX C: ENVIRONMENTAL IMPACTS OF MARSH DEVELOPMENT WITH DREDGED MATERIAL: ACUTE IMPACTS ON THE MACROBENTHIC COMMUNITY,** Virginia Inst. of Marine Science, Gloucester Point. Div. of Biological Oceanography.

R. J. Diaz, and D. F. Boesch. Available from the National Technical Information Service, Springfield, VA 22161 as AD-A055 319. Price codes: A08 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-77-23, Nov. 1977. 153 p, 19 tab, 16 ref, 2 append.

Descriptors: \*Benthos, \*Marshes, Environmental effects, \*Habitats, \*Wetlands, Virginia, \*Dredged material disposal, \*James River(Va), Waste disposal sites, Windmill Point, Waste disposal, Water pollution effects.

Macrobenthos was sampled in a tidal freshwater portion of the James River, Virginia, near Windmill Point, in the area of construction of a wetlands habitat from dredged material. The habitat development was directed by the U. S. Army Engineer Waterways Experiment Station under the Dredged Material Research Program with the cooperation of the U. S. Army Engineer District, Norfolk. The benthic communities in the area of the habitat development site were dominated by the bivalve *Corbicula manilensis*; the oligochaetes *Limnodrilus* spp., *Ilyodrilus templetoni*, *Limnodrilus hoffmeisteri*; and larvae of the insects *Coelotanyptus scapularis* and *Hexagenia mingo*. The dominant organisms are generally eurytopic with respect to sediments; many had higher densities in muddy sediments, although *Corbicula* preferred sand. Most of the important species were highly opportunistic and thus the community was able to recover quickly from perturbations. This characteristic minimized the effects of habitat development. Acute impacts were detected at the habitat site where organisms were buried by construction and at the excavation where organisms were removed along with the sand and gravel used in construction of the dike. (WES) W78-10954

**AVAILABILITY OF SEDIMENT-ADSORBED SELECTED PESTICIDES TO BENTHOS WITH PARTICULAR EMPHASIS ON DEPOSIT-FEEDING INFAUNA,** LFE Environmental Analysis Labs., Richmond, CA.

M. W. Nathans, and T. J. Bechtel. Available from the National Technical Information Service, Springfield, VA 22161 as AD-A055 506. Price codes: A05 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-77-34, Nov. 1977. 83 p, 16 tab, 12 fig, 24 ref, 2 append.

Descriptors: \*Aquatic animals, \*Benthos, \*DDT, \*Pesticides, \*Sediments, Absorption, \*Deposit-feeding, \*Dredged materials, \*Infauna.

As part of the Dredged Material Research Program, a study was undertaken to determine the availability of sediment adsorbed DDT (and its metabolites) by several species of deposit-feeding benthic infauna that may form a link for the entry of DDT into aquatic food webs. The experiments species studied were *Capitella capitata*, a non-selective feeding marine polychaete; *Nephtys californiensis*, a selective feeding marine polychaete; and *Tubifex tubifex*, a nonselective

feeding freshwater oligochaete. Sediments were artificially composited from silica sand, clay, and aged baby cereal for Tubifex, and from fired beach sand, clay, and aged baby cereal for Capitella. The clay and cereal components were tagged separately with radioactively labeled DDT prior to mixing with the sand, the final theoretical concentrations being 1 ppb 14C-labeled DDT and 1 ppb 3H-labeled DDT. For Nephys the sediment of its natural habitat was tagged with 14C-labeled DDT to a final concentration of 0.6 ppb. DDT with both labels was found to accumulate in Capitella and in Tubifex. This indicates that at least some of the DDT is available when adsorbed on clay and on organic matter. Accumulation was also found in Nephys, but most of the DDT originated from clay. (WES)  
W78-10955

#### PRIMARY PRODUCTIVITY OF MINOR MARSH PLANTS IN DELAWARE, GEORGIA, AND MAINE

Georgia Univ., Brunswick. Marine Resources Extension Center.  
R. J. Reimold, and R. A. Linthurst.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 164. Price codes: A06 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-77-36, Nov. 1977. 138 p, 14 tab, 21 fig, 21 ref, 4 append.

Descriptors: \*Coastal marshes, \*Marsh plants, \*Plant growth, Maine, Georgia, Delaware, \*Salt marshes, \*Wetlands, \*Primary productivity, Plant populations, \*Dredged material disposal, Waste disposal, Water pollution effects.

Summaries are presented of the importance of common species of salt marsh plants inhabiting wetlands of the eastern U.S. coast. An evaluation of the ecological significance of the plants is based on their rates of primary production, mortality, and contribution of detritus to the estuarine dependent systems. The data are important in reaching decisions relative to the deposition of dredged material in these coastal wetland systems. (WES)  
W78-10956

#### SEAGRASS LITERATURE SURVEY

Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

For primary bibliographic entry see Field 2L.

W78-10958

#### AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX B: ROLE OF DISPOSAL OF PCB-CONTAMINATED SEDIMENT IN THE ACCUMULATION OF PCB'S BY MARINE ANIMALS

National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.  
V. F. Stout, and L. G. Lewis.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A055 218. Price codes: A03 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Miss., Technical Report D-77-24, Nov. 1977. 40 p, 13 tab, 18 ref.

Descriptors: \*Marine animals, \*Polychlorinated biphenyls, Sediments, Washington, \*Dredged material disposal, \*Puget Sound, \*Waste disposal sites, \*Duwamish Waterway (Wash), Absorption, English sole, Pink shrimp, Mussels, Sea cucumber.

This report describes studies concerning the possible transfer to marine animals of polychlorinated biphenyls (PCB's) as a result of the open-water disposal of PCB-laden dredged material. Dredged material from the Duwamish River in Seattle, Washington, was deposited at an experimental site

in nearby Elliott Bay. The PCB content of indigenous animals, English sole (*Parophrys vetulus*) and Alaska and Oregon pink shrimp (*Pandalus borealis* and *P. jordani*), and animals caged at the site, spot shrimp (*P. platyceros*), sea cucumber (*Parastichopus californicus*), and mussel (*Mytilus edulis*) was determined. It was not possible to ascertain whether or not marine animals concentrate PCB's as the result of deposition of PCB-laden dredged material. The small increase in PCB level observed in mussels may have been related to the flux of PCB's resulting from the disposal operation. Alternatively, it may have issued from the PCB burden normally carried downstream by the Duwamish River. These data indicate that no obvious changes have occurred in the PCB levels in marine animals in Elliott Bay as the result of depositing PCB-laden dredged material at the experimental site. (WES)  
W78-10959

#### AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; APPENDIX E: DEMERSAL FISH AND DECAPOD SHELLFISH STUDIES

National Marine Fisheries Service, Hammond, OR.

J. T. Durkin, and S. J. Lipovsky.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A648 412. Price codes: A09 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-30, November 1977. 182 p, 5 tab, 81 ref, 48 fig, 5 append.

Descriptors: \*Fish, \*Columbia River estuary, \*Fish populations, \*Shellfish (Decapods), \*Demersal fish, Fish food organisms, \*Dredged material disposal, Waste disposal sites, Estuaries, Waste disposal, Water pollution effects.

Information is provided on 51 finfish and 13 decapod shellfish found at five sites off the Columbia River mouth. The effects of a controlled sediment release by hopper dredges on these indigenous species were studied between October 1974 and April 1976. An initial nine-month phase provided biological information at four sites with a fifth site included in July 1975, as an experimental deposition area. Nonparametric test indices of community diversity usually decreased at the experimental test site during and after sediment deposition. However, diversity indices subsequently recovered and were comparable to those of the other sites by April 1976. Characteristics of dominant species are described including size range, food preference, and seasonal availability. Using data on dominant species, statistical tests indicated catch differences usually occurred between sites and between months; further, individuals at the test site were smaller. Tests were limited by small numbers of species and individuals taken at the test site during and after sediment deposition. (WES)  
W78-10960

#### WATERWEEDS: FLIES IN THE IRRIGATION OINTMENT

For primary bibliographic entry see Field 4A.

W78-10969

#### ACUTE LETHALITY, AND SUB-LETHAL EFFECTS OF ACETONE, ETHANOL, AND PROPYLENE GLYCOL ON THE CARDIOVASCULAR AND RESPIRATORY SYSTEMS OF RAINBOW TROUT (*SALMO GAIRDNERI*)

Fisheries and Marine Service Winnipeg (Manitoba), Freshwater Inst.

H. S. Majewski, J. F. Klavervamp, and D. P. Scott.

Water Research, Vol. 13, p. 217-221, 1978. 4 fig., 19 ref.

Descriptors: \*Toxicity, \*Lethal limit, Fish physiology, \*Rainbow trout, Animal metabolism, Organic compounds, Growth stages, Fry, Animal physiology, Respiration, Bioassay, Mortality, Solvents, \*Acetone, \*Ethanol, \*Propylene glycol, Cardiovascular system.

The 24 h LC50 for acetone and ethanol in a flow-through bioassay system at 10°C plus or minus 0.5, are 6100 mg/l and 11,200 mg/l, respectively. No mortality to fingerling trout was produced by propylene glycol at 50,000 mg/l during a 24 h exposure period in a static system. Acetone and ethanol, at about 0.48 and 0.26 of the fingerling LC50, respectively, affected cardiovascular/respiratory parameters in adult rainbow trout. Acetone produced an increase in ventilation rate to a maximum of 158% of control values, as well as an increase in buccal pressure amplitude attaining a maximum of 410% of control values. Ethanol exposed fish exhibited a slight depression in ventilation rate and buccal pressure amplitude during initial stages of the 24 h exposure period. Ethanol had no effect on heart rate, despite a significant decrease in Q-T interval. Propylene glycol, at less than 0.08 of a concentration not producing apparent stress in fingerlings, had a mildly stimulatory effect on ventilation rate, and heart rate in adults. It is concluded that of the three solvents employed in this study, propylene glycol is most suitable for use as a solvent in fish toxicity tests. (EIS-Katz).  
W78-10997

#### EFFECTS OF PETROLEUM HYDROCARBONS ON THE GROWTH OF MARINE ORGANISMS, TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF BIOLOGY

J. W. Anderson.

Rapports et Proces-Verbaux des Reunions, Conseil International pour l'Exploration de la Mer, Vol. 171, p. 157-165, 1977. 4 fig., 4 tab., 29 ref.

Descriptors: \*Shrimp, \*Oysters, \*Commercial shellfish, \*Growth rates, \*Reproduction, \*Oil, Hatching, \*Phytoplankton, Water pollution effects, \*Annelids, Marine fish, Shellfish, Invertebrates, Environmental effects, Animal growth, Laboratory tests, Larvae, Embryonic growth stage, Oil spills, Penaeus, Crassostrea, \*Crude oil, \*Sublethal effects, Cyprinodon, Fundulus.

Several species of marine organisms, ranging from phytoplankton to fish, have been tested for various growth and reproduction parameters in response to exposure to two crude (Kuwait and South Louisiana) and two refined oils (No. 2 fuel oil and Venezuelan Bunker C). The growth of oysters (*Crassostrea virginica*) and brown shrimp (*Penaeus aztecus*) was not affected by oil exposures, while 3.5 mg/litre of total dissolved hydrocarbons (from No. 2 fuel oil) reduced embryonic heart beat and hatching success of two fish species and 0.3 to 0.7 mg/litre decreased the growth rates of larval *Palaeomonetes pugio*, juvenile *Neanthes arenaceodentata*, and three species of phytoplankton. (EIS-Katz).  
W78-10998

#### FISH DIVERSION AND TRANSPORTATION SYSTEM FOR POWER PLANT APPLICATION

Stone and Webster Engineering Corp., New York. For primary bibliographic entry see Field 8L.

W78-10999

#### FATE OF HYDROCARBONS IN FISH

Torry Research Station, Aberdeen (Scotland).

K. J. Whittle, J. Murray, P. R. Mackie, R. Hardy, and J. Farmer.

Rapports et Proces-Verbaux des Reunions, Conseil International pour l'Exploration de la Mer, Vol. 171, p. 139-142, 1977. 2 tab, 8 ref.

Descriptors: \*Food chains, \*Herring, \*Absorption, \*Carbon radioisotopes, \*Path of pol-

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects Of Pollution

lutants, \*Oil, \*Distribution patterns, Laboratory tests, Tracers, Fish physiology, Metabolism, Analytical techniques, Organic compounds, Tissue analysis, \*Hexadecane, \*Benzo(a)pyrene, Bioaccumulation, Depuration.

Juvenile herring were fed an experimental diet of squid containing (14C)-labelled hexadecane and benzo(a)pyrene and the distribution of activity in various tissues and organs was assayed 43-45 h later. 24-25% of the activity fed was recovered in the tissue and organs examined but the distribution of activity in these was quite different for each hydrocarbon. Most of the hexadecane recovered was found in the muscle but most of the benzo(a)pyrene remained in the stomach. (EIS-Katz)  
W78-11000

**BIOGENIC HYDROCARBONS AND PETROLEUM FRACTIONS,**  
Institut Français du Pétrole, Rueil-Malmaison (France).  
For primary bibliographic entry see Field 5A.  
W78-11001

**ON THE ORIGIN OF HYDROCARBONS IN MARINE ORGANISMS,**  
Torry Research Station, Aberdeen (Scotland).  
For primary bibliographic entry see Field 5B.  
W78-11002

**ALARMING SIGNS OF MERCURY POLLUTION IN A FRESHWATER AREA OF THAILAND,**  
Helsinki Univ. (Finland). Dept. of Environmental Science.  
S. Suckcharoen, P. Nuorteva, and E. Hasanen.  
Ambio, Vol. 7, No. 3, p 114-116, 1978. 4 fig, 3 tab, 19 ref.

Descriptors: \*Mercury, \*Metals, Freshwater fish, \*Public health, Water pollution effects, Path of pollutants, \*Industrial wastes, Birds, \*Human pathology, Aquatic animals, Chemical industry, Chemical wastes, \*Thailand, \*Aquatic birds, Caustic soda factory, Mercury accumulation.

Freshwater fish hold a position of prime importance in the diet of the population of Thailand. The present observations show that the baseline mercury contaminations of Thai fish are among the lowest in the world (mean 0.07 ppm, range 0.002-0.30 ppm in flesh). The amount of mercury in human hair was also rather low in unpolluted areas (mean 2.33 ppm, range 0.77-14.0 ppm). Aquatic birds had a mean mercury content in the pectoral muscle of 0.27 ppm (range 0.15-1.56 ppm). A local increase was, however, observed in the flesh of the fish *Ophiocephalus striatus* in the vicinity of a recently established Japanese caustic soda factory, where the observed mercury values varied from 0.32 ppm to 3.6 ppm. Signs of mercury accumulation in the tip portion of human hair were observed in males but not in females living in the polluted area. (EIS-Katz)  
W78-11003

**MODIFICATION IN THE CELLULAR FORM OF BOERGENSENIA FORBESII BY POTASSIUM, CALCIUM AND MAGNESIUM IONS,**  
Kochi Univ. (Japan). Dept. of Biology.  
S. Mizuta.  
Reports of the USA Marine Biological Station, Vol. 24, No. 1-2, p 27-36, December, 1977. 12 fig, 13 ref.

Descriptors: \*Potassium, \*Magnesium, \*Calcium, \*Algae, \*Nutrients, Plant physiology, \*Absorption, Biochemistry, Laboratory tests, Methodology, Aquatic plants, Growth rates, Plant growth, Metals, Ions, Environmental effects, Water properties, \*Boergensenia, Bioaccumulation.

The effects of K<sup>+</sup>, Ca<sup>++</sup>, and Mg<sup>++</sup> on the growth of *Boergensenia forbesii* were examined. The cell grew most rapidly in 16 mM equiv. K<sup>+</sup> in the presence of low concentrations of Ca<sup>++</sup> and Mg<sup>++</sup>, and the cellular form proved to be regulated by the concentration of K<sup>+</sup>. Low concentrations of K<sup>+</sup> induced slender cells but increasing concentrations of K<sup>+</sup> made the cells globular. The cellular form showed a close relationship to the balance of K<sup>+</sup> to Na<sup>+</sup> concentrations in the vacuole. When the cells were cultured at lower concentrations of K<sup>+</sup>, the vacuolar K<sup>+</sup> concentration became lower and Na<sup>+</sup> higher. Even in the medium, containing higher concentrations of K<sup>+</sup> than in the control culture a similar relation between the vacuolar K<sup>+</sup> and Na<sup>+</sup> concentrations was observed. The effects of Ca<sup>++</sup> and Mg<sup>++</sup> on K<sup>+</sup> and Na<sup>+</sup> ion concentrations in the vacuoles were also tested, but the effects proved to be less conspicuous than that of K<sup>+</sup>. When one of the K<sup>+</sup>, Ca<sup>++</sup> and Mg<sup>++</sup> ions was removed from the culture media, the concentration of vacuolar K<sup>+</sup> rapidly decreased and that of Na<sup>+</sup> increased and then the cells died in a few days. It is considered that K<sup>+</sup>, Ca<sup>++</sup> and Mg<sup>++</sup> are all required for the integrity of the cell. (EIS-Katz)  
W78-11004

**EFFECTS OF CADMIUM AND MERCURY ON THE BEHAVIORAL RESPONSES AND DEVELOPMENT OF EURYPANOEUS DEPRESSUS LARVAE,**  
South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal Research.  
D. Z. Mirkes, W. B. Vernberg, and P. J. DeCoursey.  
Marine Biology, Vol. 47, p 143-147, 1978. 5 fig, 28 ref.

Descriptors: \*Animal behavior, \*Larvae, \*Cadmium, \*Mercury, \*Crabs, \*Growth rates, \*Mortality, \*Path of pollutants, Behavior, Estuarine fisheries, Laboratory tests, Swimming, Metals, Heavy metals, Water pollution effects, Toxicity, Toxins, Bioassay, Crustaceans, Larval growth stage, \*Eurypanoeus, \*Sublethal effects.

Larval stages of the estuarine mud crab *Eurypanoeus depressus* were exposed to either 10 ppb cadmium or 1.8 ppb mercury in a flow-through rearing system. Development time from the megalopa to juvenile crab was extended in the cadmium-exposed individuals. Cadmium elevated the swimming rates of the late zoeal stages, while mercury depressed swimming rates of the early stages. Increased mortality of Stage I zoeae was observed after 24 h exposure to cadmium; increased mortality was also noted for megalopa and early crab stages reared in cadmium. (EIS-Katz)  
W78-11005

**ZINC, CADMIUM AND LEAD IN WATER, SEDIMENTS AND SUBMERGED PLANTS OF THE DERWENT RESERVOIR, NORTHERN ENGLAND,**  
Durham Univ. (England). Dept. of Botany.  
For primary bibliographic entry see Field 5B.  
W78-11006

**POLLUTION EFFECTS ON INTERTIDAL MACROBENTHIC COMMUNITIES,**  
Napier Coll. of Commerce and Technology Edinburgh (Scotland).  
P. A. Read, T. Renshaw, and K. J. Anderson.  
Journal of Applied Ecology, Vol. 15, p 14-31, 1978. 10 tab, 17 ref.

Descriptors: Analytical techniques, \*Statistical methods, Water pollution effects, \*Dominant organisms, \*Distribution, \*Seasonal, \*Intertidal areas, Biological communities, Ecological distribution, On-site investigations, Environmental effects, Temporal distribution, Spatial distribution, Benthos, Probability of interspecific encounters, \*Species diversity, \*Firth of Forth (Scotland).

Changes in macrobenthic community structure along a pollution gradient in the Firth of Forth were observed and quantified using four different measures of 'diversity'. The four diversity indices were found to be closely correlated with one another, the probability of interspecific encounter (PIE) being the one nearest to the centroid of the four. Similar changes were observed along the pollution gradient for all, but the Evenness index which reflected a somewhat different tendency. Results show that gross pollution diminishes both 'dominance diversity' and 'species diversity', whereas more moderate pollution reduces 'species diversity' but is less effective in regulating 'dominance diversity'. Differences in diversity and abundance between traverses and between levels at any one site can be explained by reference to various environmental factors. Temporal changes in species numbers and individuals are apparent at all sites and these are reflected in the PIE values. The smallest temporal changes in PIE are associated with a grossly polluted beach (a stressed community) whereas the largest relate to a relatively unpolluted beach (an unstressed community). This conflicts with the view that temporal change is large under physiological stress conditions in unstable environments and small under minimal stress conditions in physically stable environments. (EIS-Katz)  
W78-11007

**EFFECTS OF MOSQUITO CONTROL INSECTICIDES ON NITROGEN FIXATION AND GROWTH OF BLUE-GREEN ALGAE IN NATURAL PLANKTON ASSOCIATIONS,**  
California Univ., Davis. Div. of Wildlife and Fisheries Biology.  
W. A. Wurtsbaugh, and C. S. Apperson.  
Bulletin of Environmental Contamination and Toxicology, Vol. 19, p 641-647, 1978. 1 fig, 1 tab, 18 ref.

Descriptors: \*Cyanophyta, \*Nitrogen fixation, \*Growth rates, Pesticides, Plankton, Zooplankton, Nitrogen cycle, Mode of action, Pesticide kinetics, Toxicity, Mortality, Insecticides, Chlorophyll, Photosynthesis, \*Temephos, \*Methoxychlor, \*Methoprene, \*Proxopur, \*Dimilin.

Regardless of whether pesticides act directly on blue-green algae or indirectly through actions upon other organisms, our study indicates that normally used dosages of pesticides can markedly affect N<sub>2</sub>-fixation rates and growth of blue-green algae, and consequently the nitrogen flow in aquatic systems. The significance of this effect depends upon the particular aquatic habitat to which the pesticides are applied. Certainly an increase of N<sub>2</sub>-fixation in a rice field would be desirable. Conversely, higher rates of N<sub>2</sub>-fixation and growth of blue-green algae in a recreational lake or potable water supply would have a detrimental effect on water quality. (EIS-Katz)  
W78-11010

**PASSAGE OF METALS TO FRESHWATER FISH FROM THEIR FOOD,**  
Otago Univ., Dunedin (New Zealand). Dept. of Microbiology.  
F. M. Patrick, and M. W. Loutit.  
Water Research, Vol. 12, p 395-398, 1978. 2 fig, 2 tab, 19 ref.

Descriptors: \*Bacteria, \*Tubificids, \*Food chains, Copper, Chromium, Manganese, Iron, Lead, Zinc, Worms, Metals, Heavy metals, Fish physiology, Animal metabolism, Freshwater fish, Food chains, Water pollution effects, Path of pollutants, \*Tissue analysis, \*Bioaccumulation, \*Biomagnification.

Following work showing that Cr, Cu, Mn, Fe, Pb, and Zn could be concentrated by tubificid worms after ingesting metal-enriched heterotrophic bacteria, experiments were carried out in which fish,



(ed) these worms, showed increased metal levels in their tissues after four days. Only Pb was found in increased concentrations after a shorter period of two days. Both young and older fish were used in the experiment. The results indicate that increased levels of most metals in the fish reflect the concentrations of the metals in their food were exposed to the food for longer than two to four days, and that the age of the fish has an effect on their final metal concentrations. (EIS-Katz)  
W78-11012

**THE ALKANES OF MARINE ORGANISMS FROM THE UNITED KINGDOM AND SURROUNDING WATERS.**  
Torry Research Station, Aberdeen (Scotland).  
For primary bibliographic entry see Field 5B.  
W78-11013

**THE EFFECTS OF OIL ON SEABIRDS.**  
Newcastle-upon-Tyne Univ. (England). Dept. of Zoology.  
J. P. Croxhall.  
Rapports et Proces-Verbaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol. 171, p 191-195, 1977. 3 tab, 25 ref.

Descriptors: \*Waterbirds, \*Oil pollution, \*Oil, Water pollution effects, \*Mortality, \*Environmental effects, Animal physiology, \*Biochemistry, \*Organic compounds, \*Oil spills, Birds, Wildlife, Dispersion, Ducks(Wild), Gulls, Path of pollutants, Laboratory tests, \*Auks, \*Sublethal effects.

Seabirds are not only the most obvious victims of oil pollution but perhaps the only group where oil pollution may pose a survival threat. The external effect of oil in destroying plumage waterproofing is detailed and the state of knowledge of the direct and indirect internal effects of crude and fuel oils reviewed, inevitably in rather general terms. The need for more precise information on the behavior of oil slicks and oil/dispersant mixtures and films at sea is emphasised in relation to potential techniques and strategies for minimising the high risk to seabirds (whether at breeding colonies or on wintering grounds) from oil slicks. (EIS-Katz)  
W78-11014

**THE SUB-LETHAL EFFECTS OF WATER-SOLUBLE EXTRACTS OF CRUDE OIL ON THE FERTILISATION AND DEVELOPMENT OF FUCUS SERRATUS L. (SERRATED WRACK).**  
Heriot-Watt Univ., Edinburgh (Scotland). Dept. of Brewing and Biological Sciences.  
C. S. Johnston.  
Rapports et Proces-Verbaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol. 171, p 184-185, 1977. 3 ref.

Descriptors: \*Oil spills, \*Marine plants, \*Shores, \*Oil pollution, \*Plant populations, \*Fertilisation, \*Bioassay, \*Organic compounds, \*Embryonic growth stage, Laboratory tests, Environmental effects, Water pollution effects, Aquatic populations, Reproduction, Plant physiology, \*Fucus, \*Crude oil, \*Sublethal effects.

Many studies of oil pollution have shown that shore algae frequently flourish following elimination or severe reduction of the more sensitive grazing organisms. Preliminary studies suggest that although adult fucoid plants can tolerate exposure to spillage of crude oil, the young developing zygote is sensitive to relatively low concentrations of 'water soluble' extracts of crude oils. (EIS-Katz)  
W78-11015

**THE EFFECT OF MINERAL OILS ON THE DEVELOPMENT OF EGGS AND LARVAE OF MARINE SPECIES. A REVIEW AND COM-**

**PARISON OF EXPERIMENTAL DATA IN REGARD TO POSSIBLE DAMAGE AT SEA.**  
Kiel Univ. (West Germany). Inst. fuer Meereskunde.  
W. W. Kuhnhold.

Rapports et Proces-Verbaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol. 171, p 175-183, 1977. 5 tab, 3 fig, 26 ref.

Descriptors: \*Reviews, Toxicity, \*Metabolism, \*Life cycles, \*Oil spills, Oil, \*Water pollution effects, \*Organic compounds, \*Food chains, \*Path of pollutants, \*Marine pollutants, \*Larval growth stage, \*Embryonic growth stage, Growth stages, Oil wastes, Biological communities, Mollusks, Shrimp, Absorption, Fish eggs, Laboratory tests, Invertebrates, Oysters, Crustaceans, Herrings, Lethal limit, Mortality.

The paper gives a review of relevant publications. There are astonishingly few papers on the toxicological or metabolic effects on the generally most susceptible stages of the life cycle. Most experiments were carried out with different experimental parameters (temperature, salinity, species). The most important data are lacking: contents and spectrum of hydrocarbons in the test medium. The data given in the papers are tabulated and compared. It is, however, impossible to draw a general conclusion of a connecting pattern of influence of hydrocarbons. Corresponding field observations on eggs and larvae do not exist. (EIS-Katz)  
W78-11016

**WATER SOLUBLE EXTRACTIVES FROM PETROLEUM OILS: CHEMICAL CHARACTERIZATION AND EFFECTS ON MICROALGAE AND MARINE ANIMALS.**  
Texas Univ. at Austin, Port Aransas. Marine Science Inst.

K. Winters, C. Van Baalen, and J. A. C. Nicol.  
Rapports et Proces-Verbaux des Reunions, Conseil International Pour L'Exploration de la Mer, Vol. 171, p 166-174, 1977. 8 tab, 5 fig, 6 ref.

Descriptors: \*Chlorella, \*Algae, \*Diatoms, \*Toxicity, \*Mortality, Fuels, \*Oil, \*Bioassay, \*Aromatic compounds, \*Animal behavior, \*Embryonic growth stage, \*Larvae, \*Crabs, \*Crustaceans, \*Reproduction, \*Marine animals, Aquatic microorganisms, Cyanophyta, Chlorophyta, Oil wastes, Chemical analysis, Organic compounds, Invertebrates, Coccochloris, Dunaliella, Melitta, Balanus, Artemia, Amphora, Toluidines, Dimethylaminolines.

Chemical analyses of four lots of No. 2 fuel oils were carried out. They were Montana, Baytown, New Jersey and Baton Rouge, supplied by Exxon Corporation. The major components of aromatics in the water were identified and concentrations determined. The fuel oils were tested against six strains of microalgae, two blue greens PR-6 (Agmenellum quadruplicatum), 17A (Coccochloris elabens); two greens DUN (Dunaliella tertiolecta) 580 (Chlorella autotrophica); and two diatoms N-1 (Cylindrotheca sp.) and AMP-1 (Amphora sp.). Microalgae differed in sensitivity to an oil; an alga differed in sensitivity to several oils. Data are presented for toxicities of aromatic compounds found in oils; toluidines were especially toxic to blue-green algae. Animals—barnacle eggs, anuplii, sand dollar eggs and embryos, crab larvae, and a pteropod—were exposed to crude oils, fuel oil and aromatic compounds, and mortalities determined. Fuel oils and crankcase oils were especially toxic. (EIS-Katz)  
W78-11017

**TOXICOLOGICAL EFFECTS OF MERCURY ON A FRESHWATER FISH, ANABAS SCANDENS, CUV. & VA. AND THEIR ECOLOGICAL IMPLICATIONS.**  
Berhampur Univ., Crissa (India). Environmental Biology Lab.  
A. K. Panigrahi, and B. N. Misra.

Environmental Pollution, Vol. 16, p 31-39, 1978. 6 fig, 23 ref.

Descriptors: \*Mercury, Metals, \*Freshwater fish, Bioassay, Toxicity, \*Pathology, Fish behavior, Water pollution effects, Fish physiology, Biochemistry, Algae, Laboratory tests, Bioaccumulation, India, \*Anabas, Hemoglobin, Red blood cell count, Protein content, Mercury accumulation.

Fish exposed to mercuric nitrate all died in concentrations greater than 5 mg/l. However, at 3 mg/l they survived although they showed a variety of pathological and biochemical disorders. The main clinical symptoms such as inappetence and ataxia appeared after 5 days' exposure. After 3 weeks' exposure, blindness was noted in 29% of the fish and respiratory rate was considerably reduced. After 4 weeks a total of 71% had become blind. Partial recovery of respiratory rate occurred in all treated fish when they were transferred to fresh, mercury-free water. Considerable reductions in haemoglobin percentage, red blood cell (RBC) count, body weight and protein content of the treated fish were observed. The mean concentration of mercury in the liver of the fish exposed for a period of 45 days was as high as 3.0 plus or minus 0.16 micro g g<sup>-1</sup> wet tissue and in the muscles 2.8 plus or minus 0.18 micro g g<sup>-1</sup> wet tissue, while concentrations in untreated liver and muscle were 0.20 plus or minus 0.05 and 0.12 plus or minus 0.05 micro g g<sup>-1</sup> wet tissue, respectively. The physiological and biochemical disorders were related to the concentrations of mercury in the tissue. Mercury accumulation in algae and Hydrilla plants was 0.76 plus or minus 0.022 and 0.83 plus or minus 0.035 micro g g<sup>-1</sup> wet weight, respectively within a period of 45 days' exposure. (EIS-Katz)  
W78-11018

**EFFECTS OF HEPTACHLOR AND TOXAPHENE ON LABORATORY-REARED EMBRYOS AND FRY OF THE SHEEPSHEAD MINNOW.**  
Environmental Research Lab., Gulf Breeze, FL.  
L. R. Goodman, D. J. Hansen, J. A. Couch, and J. Forester.

In: Proceedings of the Thirtieth Annual Conference, Southeastern Association of Fish and Wildlife Agencies, October 24-27, 1976, Jackson, Mississippi. p 192-202. 10 fig, 2 tab, 16 ref.

Descriptors: \*Bioassay, \*Toxicity, \*Heptachlor, \*Absorption, \*Embryonic growth stage, Minnows, Fry, \*Lethal limit, \*Growth rates, Pathology, Hatching, \*Fish behavior, Water pollution effects, Estuarine environment, Microscopy, Fish eggs, Laboratory tests, Chlorinated hydrocarbon pesticides, Halogenated pesticides, Fish reproduction, \*Toxaphene, Bioconcentration, Cyprinodon variegatus, Sublethal effects.

Flow-through seawater bioassays of 28-days duration were conducted with the organochlorine pesticides heptachlor and toxaphene to determine their toxicity to and bioconcentration by embryos and fry of the sheepshead minnow (Cyprinodon variegatus). At technical heptachlor measured concentrations of 4.3, 3.5, 2.2, 2.0, and 1.2 micro g/l (ppb), test animal survival was 1, 5, 61, 79, and 88% respectively. At toxaphene measured concentrations of 2.5, 1.1, 0.6, 0.3, and 0.2 micro g/l/m test animal survival was 10, 85, 79, 88, and 80%, respectively. Average standard length of fry continuously exposed from fertilization to heptachlor concentrations of 4.3 and 3.5 was significantly reduced. Concentration factors (concentration in fish/measured concentration in water) for heptachlor averaged 3,600 and for trans-chlordane averaged 8,600. Heptachlor epoxide and cis-chlordane were also present in the fish. Concentration factors for toxaphene in fry averaged 9,800. Various histopathological characteristics not seen in control fish were observed in the liver, kidney, pancreas, and intestine of the few fish that survived the 4.3 and 3.5 micro g/l of heptachlor. (EIS-Katz)

### Group 5C—Effects Of Pollution

W78-11020

Virginia Polytechnic Inst. and State Univ.,  
Blacksburg. Dept. of Fisheries and Wildlife  
Sciences.

E. D. Prince, R. J. Strange, and G. M. Simmons,  
Jr.

In: Proceedings of the Thirtieth Annual Conference, Southeastern Association of Fish and Wildlife Agencies, October 24-27, 1976. Jackson, Mississippi p 207-215 2 fig, 3 tab, 25 ref.

Descriptors: \*Primary productivity, Productivity, \*Phytoplankton, \*Periphyton, \*Diatoms, \*Algae, \*Chlorophylla, \*Food chains, \*Artificial substrates, \*Fish food organisms, \*Nutrients, \*On-site investigations, Biological communities, Aquatic plants, Biomass, Dissolved oxygen, Equipment, Euphotic zone, \*Artificial tire reefs, \*Smith Mountain Lake(Virginia).

Primary productivity and nutrient concentrations were compared between the periphyton community on a freshwater artificial tire reef and the littoral phytoplankton in Smith Mountain Lake, Virginia, during the months of July, August, and September 1974. Primary productivity and nutrient concentrations of the periphyton community were several times greater than that of the littoral phytoplankton. The periphyton community was dominated by pennate diatoms and filamentous green algae. Productivity measurements of the reef periphyton were on the same order of magnitude as the highest periphyton production rates reported in the literature. High productivity of the tire reef periphyton supports the hypothesis that freshwater artificial reefs support increased densities of fish and invertebrates by enhancing the productivity of aquatic environments. (EIS-Katz)

Akademiya Nauk SSSR, Moscow, Inst. Biologii  
Vnutrennykh Vod.

M. M. Kamshilov.  
Hydrobiological Journal, Vol. 13, No. 1, p 1-8,  
1977. 70 ref.

Descriptors: \*Plant pigments, \*Phytoplankton, \*Biomass, \*Self-purification, \*Zooplankton, \*Biodegradation, Algae, Aquatic bacteria, Organic compounds, Degradation(Decomposition), Pigments, Water purification, Pollutant abatement, Water quality, Eutrophication, Chlorophyll, Diatoms, Chlorophyta, Aquatic microorganisms, \*Flagellata, \*Volga River, Lemna.

Long-term investigations of the floristic composition of the water of the Volga indicate increase in its saprobicity. Studies of the composition of the photosynthetic pigments in the phytoplankton of different Volga basin reservoirs have enabled us to estimate their average content per unit of phytoplankton biomass and to determine the basic factors on which it is dependent. The role of the colorless *Flagellata* in the biotic cycle of reservoirs was elucidated. The process of breakdown of phenol under experimental and field conditions is used to illustrate the proposition that analysis of the biological factors involved in the breakdown of organic matter in the aquatic environment should be approached from biogeocoenological positions, and methods of biogeocoenology should be applied. (FIS-Katz)  
W78-11022

**SOME EFFECTS OF PAPER AND PULP MILL EFFLUENTS ON SOUTHERN LAKE SAIMAA,**  
Limnological Inst., Oosterzee (Netherlands).

H. de Haan, and I. Kettunen.

Aqua Fennica, p 41-51, 1976. 6 fig, 3 tab, 7 ref.

Descriptors: \*Seasonal, \*Pulp wastes, \*Water quality, \*Biochemical oxygen demand, \*Water pollution effects, Limnology, Autumn, Winter, Organic matter, Industrial wastes, Lignins, Dissolved oxygen, Aquatic bacteria, Phenols, Surface waters, Pulp and paper industry, Lake Saimaa(Finland).

The effect of paper and pulp mill effluents on southern Lake Saimaa was investigated each fortnight for 9 months by performing ten different analyses on surface and hypolimnion samples from 11 sampling stations. The analyses included Chemical Oxygen Demand, Biological Oxygen Demand, dissolved organic carbon, oxygen saturation, colour, ultra violet absorption at 250 nm, lignin, phenolic substances and heterotrophic bacteria counts. The hydrology of the waste waters appeared to be strongly dependent on the season. In autumn the waste waters mixed with the lake water and flowed with the main surface current eastwards. In winter however the relatively warm waste waters did not mix with the cold lake water and flowed along the bottom, strongly polluting the hypolimnion of southern Lake Saimaa. Soon after the ice cover had disappeared the water was fully mixed again. The results of Sephadex gel filtration of polluted and natural water showed a relatively large amount of brown organic matter with a high molecular weight (MW greater than 10000) to be characteristic of polluted water. Natural water appeared to contain a relatively large amount of organic matter with a low molecular weight (MW less than or equal to 500). (EIS-Katz) W78-11023

**BENTHOS AROUND AN OUTFALL OF THE  
WERRIBEE SEWAGE-TREATMENT FARM,  
PORT PHILLIP BAY, VICTORIA.**

PORT PHILLIP BAY, VICTORIA,  
Victoria Ministry for Conservation, Melbourne  
(Australia). Marine Pollution Studies Group.  
G. C. B. Poore, and I. D. Kudenov.

Australian Journal of Marine and Freshwater Research, Vol. 29, p 157-167, 1978. 1 fig, 6 tab, 18 ref.

**Descriptors:** \*Benthic fauna, \*Sewage treatment, Environmental effects, \*Sewage effluent, \*Intertidal areas, \*Invertebrates, \*Estuarine environment, Water chemistry, Bottom sediments, Salinity, Nutrients, Ammonia, Nitrogen compounds, Sewage disposal, Connate water, Distribution, Benthos, Mollusks, Crustaceans, \*Australia, Werribee sewage-treatment farm, Port Phillip Bay.

A 2 square km area adjacent to the 145W outfall of the Werribee sewage-treatment farm was sampled for sediment, water chemistry and macrobenthos. Sediments nearshore were more sandy and more uniform than those offshore. Water salinity and nutrient concentrations (particularly ammonia) in overlying and interstitial water decreased rapidly with increasing distance from shore. The fauna was rich and contained several euryhaline and opportunistic species. Classification analysis revealed an offshore and a nearshore group of stations, and possibly a third group around the outfall. The distribution of common species were correlated with depth, sediment parameters or interstitial phosphate concentrations. The benthos of the 145W drain was distributed patchily but the station closest to the outfall (within 300 m) had high densities, high proportions of scavengers and deposit-feeders, high sediment organic fraction and high interstitial nutrient concentrations. The effect of the drain on the macrobenthos is exerted through particulate organic matter, dissolved nutrients and freshwater inputs. (EJS-Katz)  
W78-11024

## RESPIRATORY METABOLISM OF STRIPED BASS, MORONE SAXATILIS (WALBAUM), IN RELATION TO TEMPERATURE.

R. L. Kruger, and R. W. Brocksen.  
Journal of Experimental Marine Biology and Ecology, Vol 31, p. 55-66, 1978. 4 fig. 4 tab. 20 ref.

**Descriptors:** \*Respiration, \*Striped bass, \*Metabolism, \*Water temperature, \*Fish behavior, Juvenile fish, Sea basses, Oxygen, Temperature, Behavior, Velocity, Swimming, Fish physiology, Environmental effects, Predation, Laboratory test, Morone.

The oxygen consumption of striped bass, *Morone saxatilis* (Walbaum), has been determined using tunnel-type flowing water respirometers. Standard metabolic rates were established and active metabolic rates were determined at three water velocities: approximately 0, 5 and 10 cm/sec and five temperatures, namely, 8, 12, 16, 20 and 24°C. Using the difference between the standard and active metabolic rates at 10 cm/sec swimming velocity, a measure of the scope for activity over a limited range of velocities for striped bass was derived. The scope of activity was found to be very similar at water temperatures of 8, 12 and 16°C, being 55, 44 and 45 mg O<sub>2</sub>/kg/h, respectively for a representative 40 g striped bass. At 20 and 24°C, the scope of activity was 99 and 143 mg O<sub>2</sub>/kg/h, respectively. In terms of the potential for energy expenditure, the highest scope for activity was at 24°C and the lowest at 12°C. Extrapolations to higher swimming velocities were made from the literature. (EIS-Katz)

## CHANGES IN FISHES WITH CULTURAL LAKE EUTROPHICATION (FISCHEREILICHE

VERÄNDERUNGEN IN (FISCHEREI) KULTURBEDINGT  
EUTROPHIERENDEN SEEN),  
Staatliches Inst. fuer Seenforschung und  
Fischereiwesen, Langenargen (West Germany).  
J. Hartmann.  
Schweizerische Zeitschrift für Hydrologie, Vol  
39, No 2, p. 243-254, 1977, 2 fig., 1 tab., 66 ref.

**Descriptors:** \*Succession, \*Eutrophication, \*Benthos, Environmental effects, Fish physiology, \*Freshwater fish, Aquatic populations, Plankton, Phosphorus, Growth rates, Fish reproduction, Water pollution effects, Distribution, Primary productivity, Fish food organisms, Yellow fever, \*Coregonidae, \*Percidae, \*Cyprinidae.

Mainly from the trends of fish yield, four stages of fish succession in European lakes under cultural eutrophication are described. Trends of transparency, phosphorus, weeds, benthos, and plankton are included. Supplementary interrelated effects of eutrophication on fish biology (growth, fat content, condition, distribution, reproduction, parasites, fish kills, introgression, feeding) have been collected from literature. The effects, mainly observed on planktivores, are not specific for species or localities. (EIS-Katz)  
W78-11076

## PREDATOR-PREY INTERACTIONS OF FISHES UNDER THE INFLUENCE OF AMMONIA

D. M. Woltering, J. L. Hedtkke, and L. J. Weber.  
Transactions of the American Fisheries Society, Vol 107, No 3, p. 500-504. 1978. 2 fig. 1 tab. 16 ref.

Descriptors: \*Bass, \*Ammonia, \*Fish behavior, \*Predation, \*Growth rates, \*Fish food organisms, \*Fish physiology, Laboratory tests, Feeding rates, Water pollution effects, Environmental effects, Nitrogen compounds, Behavior, Aquatic populations, Balance of nature, Mosquito fish, Micropterus, \*Sublethal effects, Gambusia.

Food consumption of the largemouth bass was related to the behavior of the mosquitofish. The rates of predation on mosquitofish were higher in the presence of a predator than in the absence of a predator. The rates of predation on mosquitofish were higher in the presence of a predator than in the absence of a predator. The rates of predation on mosquitofish were higher in the presence of a predator than in the absence of a predator.

## SEARCH

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**PHENOL**

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Food consumption and growth rates of a predator, the largemouth bass (*Micropterus salmoides*) and the behavior of both the predator and its prey, the mosquitofish (*Gambusia affinis*) were sensitive indices of sublethal effects of ammonia on predator-prey interactions. Prey consumption and growth rates of bass in control tests increased with increasing prey densities. Ammonia concentrations of 0.63 and 0.86 mg/liter substantially decreased prey consumption and growth of bass in test tanks stocked with densities of 30, 60 and 120 mosquitofish. At a given ammonia concentration, there were greater decreases in prey consumption and growth rates of bass at higher prey densities. This can be attributed in part to the bass being more sensitive than mosquitofish to ammonia and to the harassment of the predator by the prey which occurred at high ammonia concentrations and high prey concentrations. (EIS-Katz)  
W78-11027

**SEARCH FOR NITRIFYING AGENTS IN WATER AND SOILS AS SOURCES OF NITRATES IN SURFACE WATER.**  
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.  
For primary bibliographic entry see Field 5B.  
W78-11063

**PHENOL POISONING DUE TO CONTAMINATED DRINKING WATER.**  
Bureau of Epidemiology, Atlanta, GA. Cancer and Birth Defects Div.  
E. L. Baker, P. J. Landrigan, P. E. Bertozzi, P. H. Field, and B. J. Basteys.  
Archives of Environmental Health, p 89-94, March/April, 1978. 3 fig, 2 tab, 12 ref.

Descriptors: \*Accidents, \*Water pollution, \*Phenols, \*Human diseases, Poisoning, Water wells, Wisconsin, Organic compounds, Pollutant identification.

Accidental spillage of 37,900 liters of 100% phenol (carbolic acid) in July, 1974 caused chemical contamination of wells in a rural area of southern Wisconsin. This resulted in an outbreak of human illness in several people living nearest the spill site. Analysis of water-testing data and knowledge of the physical properties of phenol (i.e. the chemical solidifies at ambient temperatures) support the prediction that those wells which now have high levels of phenol will continue to be contaminated for many years. Furthermore, these wells will be re-contaminated after every rain. It was noted that some of the variations in results of water testing related to differences in well depth and type of construction. (Purdin-NWWA)  
W78-11075

**EFFECT OF THERMAL STRESS AND TOTAL RESIDUAL CHLORINATION ON EARLY LIFE STAGES OF THE MUMMICHOG FUNDULUS HETEROCLOTUS.**  
Environmental Research Lab., Johns Island, SC. Bears Bluff Field Station.  
D. P. Middaugh, J. M. Dean, R. G. Domey, and G. Floyd.  
Marine Biology, Vol 46, No 1, 1978, p 1-8, 8 tab, 30 ref.

Descriptors: Environmental effects, \*Water pollution effects, \*Thermal pollution, Powerplants, Chlorination, Fish, Life history studies, Growth stages, Embryos, Larvae.

Developing embryonic stages of *Fundulus heteroclitus* were found to be more resistant to the deleterious effects of temperature, total residual chlorination (TRC) and duration of exposure than 0-day and 7-day-old larvae. For the embryonic stages, temperature was the only statistically significant main variable. TRC concentration and duration of exposure had no significant effect. An inverse relationship was found between hatching

success and test temperatures for the 1-2 cell and gastrula stages. The potentially detrimental effect of entrainment of eggs and larvae of an estuarine fish in coastal electric generating plants using chlorination was demonstrated. (Chilton-ORNL)  
W78-11095

**EFFECT OF TEMPERATURE ON ACTIVITY AND SOCIAL BEHAVIOR OF THE ADULT TAUTOG TAUTOGA ONITIS UNDER LABORATORY CONDITIONS.**  
National Marine Fisheries Service, Highlands, NJ. Sandy Hook Lab.  
B. L. Olla, A. L. Studholme, A. J. Bejda, C. Samet, and A. D. Martin.  
Marine Biology, Vol 45, No 4, 1978, p 369-378, 2 fig, 1 tab, 22 ref. ERDA No. E(49-7) 3045.

Descriptors: Environmental effects, \*Water pollution effects, \*Thermal pollution, Fish, Fish behavior, Temperature, Tautog.

During exposure to elevated temperature, activity of the adult *Tautoga onitis* was generally depressed. Feeding, aggression and interfish distance showed a decrease. Upon return to acclimation temperatures, activity, interfish distance and feeding returned to normal levels but aggression remained reduced. It was suggested that, under natural conditions tautog are subjected to temperature elevations of this level and are able to withstand and recover from these exposures. Both young and adult tautog tend to remain within their natural range and do not seek to avoid these temperatures. (Chilton-ORNL)  
W78-11096

**INFLUENCE OF TEMPERATURE ON THE REPRODUCTIVE POTENTIAL OF ONCHOLAIMUS OXYURIS (NEMATODA: ONCHOLAIMIDAE).**  
Ghent Rijksuniversiteit (Belgium). Dept. of Zoology.  
C. Heip, N. Smol, and V. Absillis.  
Marine Biology, Vol 45, No 3, 1978, p 255-260, 4 tab, 22 ref.

Descriptors: Environmental effects, \*Thermal pollution, Temperature, Reproduction, Aquatic animals, Nematodes, \*Water pollution effects.

The large predatory nematode, *Oncholaimus oxyuris*, has a long life cycle relative to its weight. The reproductive potential is low, and a yearly average of  $r$  (rate of natural increase) = 0.0104/day, corresponding with a doubling time of 67 days has been found. The generation time at the annual average temperature in the location of the test population is 232 days. It was concluded that the population inhabiting this shallow brackish-water pond produces only one generation annually and that, with continuous reproduction, the average annual temperature required to produce two generations would be 13.9°C. (Chilton-ORNL)  
W78-11097

**THE LARVAL DEVELOPMENT OF THE ROCK CRAB, CANCER IRRORATUS SAY, 1817, UNDER LABORATORY CONDITIONS (DECAPODA BRACHYURA).**  
Rhode Island Univ., Kingston. Graduate School of Oceanography.  
A. N. Sastry.  
Crustaceana, Vol 32, No 2, 1977, p 155-168, 6 fig, 28 ref. EPA (R-800981).

Descriptors: Environmental effects, Temperature, \*Salinity, \*Crabs, Larval growth stage, Growth stages, Appendages.

A detailed description of each of the five zoeal stages and a megalopa stage which metamorphoses into the crab stage of *C. irroratus* are given. Eggs hatched at 10, 15, and 20°C in 30% salinity released the first zoea which completed

development to the first crab stage with a maximum survival rate at 15°C in 30% salinity. Descriptions of functional appendages of each larval stage are given to be used as an aid in identifying the stages of development and differentiating them from larvae of other brachyuran crabs in plankton collections. (Chilton-ORNL)  
W78-11098

**AQUACULTURE OF THE GREEN MUSSEL, MYTILUS VIRIDIS LINNAEUS, IN MALAYSIA.**  
Universiti Sains Malaysia, Penang. Pusat Pengajian Sains Kajihiayat.  
For primary bibliographic entry see Field 2L.  
W78-11099

**THE EFFECTS OF A SIMULATED REFINERY EFFLUENT ON THE GRASS SHRIMP, PALAEMONETES PUGIO.**  
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies.  
L. W. Hall, Jr., A. L. Buikema, Jr., and J. Cairns, Jr.  
Archives of Environmental Contamination and Toxicology, Vol 7, 1978, p 23-35, 8 tab, 15 ref.

Descriptors: Environmental effects, \*Water pollution effects, Thermal pollution, Temperature, \*Shrimp, \*Toxicity, Effluents, Salinity, Light intensity, Photoperiodism.

An arbitrary reference mixture (ARM) which contained chemicals in the approximate concentrations recommended by EPA for 1977 was used to simulate refinery effluent. The ARM components were 0.10 mg/l phenol, 0.17 mg/l sulfide, 0.25 mg/l chromium, 10 mg/l ammonia, 10 mg/l No. 2 fuel oil, and 20 mg/l kaolinite. Results showed that light intensity, photo-period, and salinity had no significant effect upon the toxicity of the ARM to grass shrimp but that temperature was the most important environmental variable affecting short term toxicity. Collection location, genera and species differences did not affect sensitivity to the ARM. Grass shrimp were more sensitive than pinfish. (Chilton-ORNL)  
W78-11100

**THE EFFECT OF TEMPERATURE ON REPRODUCTION OF CYCLOPS VERNALIS FISCHER (COPEPODA, CYCLOPOIDA).**  
National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab.  
G. W. Hunt, and A. Robertson.  
Crustaceana, Vol 32, No 2, 1977, p 169-177, 1 fig, 3 tab, 17 ref. 18050 ELT.

Descriptors: Environmental effects, \*Thermal pollution, Temperature, Reproduction, Copepods, Eggs, Hatching, Fecundity, Longevity, Cyclops vernalis Fischer.

The purpose of this study was to observe and compare the longevity, fecundity, egg development rate and egg viability for *Cyclops vernalis* at different temperatures. Duration of the adult stage of females was found to vary with temperature. The longest period that any individual female lived after her adult molt was 84 days at 14°C and the shortest was 21 days at 31°C. Every female observed produced at least one egg sac. Clutches varied in size from 3 to 102 eggs, with both extremes being produced at 21°C. It was concluded that the factor directly determining clutch size was the female's body size. Data indicated that development rate of eggs increases linearly as temperature increases up to 26°C. From 26 to 31°C the rate of acceleration of the development rate appeared to slow down. It was concluded that hatching success of eggs was not affected by temperatures used in these experiments. (Chilton-ORNL)  
W78-11101



## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects Of Pollution

**SEASONAL CHANGES IN THE EFFECTS OF TEMPERATURE AND WATER FLOW RATE ON THE GROWTH OF JUVENILE PACIFIC OYSTERS, CRASSOSTREA GIGAS (THUNBERG),**  
Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.  
R. E. Malouf, and W. P. Breese.  
Aquaculture, Vol 12, No 1, September 1977, p 1-13, 7 fig, 3 tab, 20 ref. NOAA 04-5-158-2.

Descriptors: Environmental effects, \*Thermal pollution, Temperature, Oysters, Growth rates, Nuclear powerplants.

This study investigates the feasibility of utilizing the heated effluent from nuclear power plants for culturing oysters. Extreme seasonal changes in the growth rate of immature oysters were observed which were independent of temperature and appeared to be related to changes in the quantity of particulate organic material suspended in the water. Between November and March, growth was minimal and independent of temperature. During periods when food availability and water flow rate were low, growth was observed to be inversely related to temperature between 10 and 23°C. It was suggested that maximum growth might be obtained at a temperature near 20°C if other conditions are ideal and food availability high. (Chilton-ORNL)  
W78-11102

**THE SALINITY AND TEMPERATURE TOLERANCE AND THE GROWTH OF MACROBRACHIUM OHIONE (SMITH) 1874 REARED IN LABORATORY TANKS,**  
Texas A and M Univ., College Station. Dept. of Wildlife and Fisheries Sciences.  
K. Chung.  
The Texas Journal of Science, Vol 28, No 1-4, March 1977, p 271-284, 7 fig, 2 tab, 39 ref.

Descriptors: Environmental effects, \*Water pollution effects, \*Thermal pollution, Shrimp, Salinity, Temperature, Resistance, Growth rate, Mortality.

Laboratory experiments showed that differences in survival rates of shrimp in freshwater and at salinities of 2.4, 6, or 10 ppt were not significantly different at 1% level. High mortality during molting occurred when late afternoon temperatures reached 31.5°C and higher. Non-molting occurred when late afternoon temperatures reached 31.5°C and higher. Non-molting animals were able to survive temperatures of 32°C for several days. None survived at a peak temperature of 32.9°C after molting. In growth studies, the calculated maximum body length, 96.79 mm, compared favorably with reports from the literature and it was concluded that under artificial conditions, one might expect the size of adult populations to be similar to natural populations. (Chilton-ORNL)  
W78-11103

**THE EFFECTS OF THE MARSDEN 'A' THERMAL POWER STATION ON THE MARINE PLANKTON,**  
New Zealand Oceanographic Inst., Wellington.  
J. M. Bradford, and D. A. Burns.  
NZOI Records, Vol 3, No 9, April 1977, p 69-86, 7 plates, 6 fig, 4 tab, 22 ref.

Descriptors: Environmental effects, Powerplants, Cooling water, \*Plankton, Populations, Mechanical damage.

Power station effects on plankton were determined by comparing samples taken across the effluent plume with samples from the intake area. Passage through the cooling system caused considerable mechanical damage to the plankton. In considerations of the whole area, this loss is probably not detectable because the plankton of the area are continually being replenished by the general flow of water and because damaged

biological material discharged in the effluent forms the food of detrital or deposit feeding animals and is therefore not lost to the food chain. (Chilton-ORNL)  
W78-11104

**THERMAL SELECTION OF ALLOZYME POLYMORPHISMS IN BARNACLES,**  
Haifa Univ. (Israel). Dept. of Biology.  
E. Nevo, T. Shimony, and M. Libni.  
Nature, Vol 267, June 23, 1977, p 699-701, 2 tab, 21 ref.

Descriptors: Environmental effects, \*Water pollution effects, \*Thermal pollution, Temperature, Powerplants, Cooling water, Aquatic animals, Adaptation, \*Barnacles.

Barnacles were collected by immersing plates in the open Mediterranean seawater canals of the Haifa Electrical Plant Cooling System, where the temperature varies from 9 to 12°C between the cooler inflowing and warmer outflowing canals. Number of barnacles per plate in the inflowing canals was about 2,400 compared with 510 per plate in the outflowing canals. Individuals varied in size from 336 µm in the inflowing canals to 135 µm in the outflowing canals. Mean heterozygosity for all 8 loci decreased from 0.110 in the cooler to 0.047 in warmer canal. Distinct statistically significant repetitive trends in allelic frequencies were found for chosen alleles in seven out of the eight loci. It was concluded that both allozymes and size are positively selected by natural selection as adaptation to warm environments. (Chilton-ORNL)  
W78-11105

**THE EFFECT OF TEMPERATURE ON ROUTINE METABOLISM IN TILAPIA RENDALLI BOULENGER,**  
Rhodesia Univ., Salisbury. Div. of Biological Sciences.  
M. S. Caulton.  
Journal of Fish Biology, Vol 11, 1977, p 549-553, 2 fig, 1 tab, 12 ref.

Descriptors: Environmental effects, \*Water pollution effects, \*Thermal pollution, Fish, \*Metabolism, Respiration, Oxygen requirements, Energy budget, \*Tilapia rendalli.

The rate of oxygen consumption (expressed as mg O<sub>2</sub> consumed per gram of fish per unit time) of *Tilapia rendalli* was determined over the temperature range of 17-40°C. Between 17 and 28°C, oxygen consumption increased in a predictable normal logarithmic fashion which may be expected of most poikilotherms, showing a mean rate of increase of about 0.36 mg O<sub>2</sub>/d/C. From 28 to 37°C, oxygen consumption deviated from the expected logarithmic increase and was suppressed so that the demand for oxygen at this temperature range was relatively stable with a mean rate increase of only 0.19 mg O<sub>2</sub>/g/C. From 37 to 40°C, there was a rapid increase in oxygen consumption of about 1.8 mg O<sub>2</sub>/d/C. It was suggested that oxygen consumption between 28 and 37°C represents a significant energy saving function which would be a valuable credit to the daily energy budget of these fish. Good correlations were found to exist between theoretical estimates of biomass change and actual measurements of biomass change. (Chilton-ORNL)  
W78-11106

**THE OCCURRENCE AND RELATIVE ABUNDANCE OF PLANKTONIC FISH LARVAE IN ANDERSON CREEK EMBAYMENT, KENTUCKY LAKE, KENTUCKY,**  
Murray State Univ., KY. Dept. of Biological Sciences.  
W. L. Davis, and T. M. Freeze.  
Transactions of the Kentucky Academy of Science, Vol 38, No 3-4, 1977, p 120-122, 1 tab, 9 ref.

Descriptors: Environmental effects, \*Water pollution effects, \*Thermal pollution, Temperature, Populations, Fish, Plankton, Larvae, Distribution, \*Kentucky Lake (KY).

99.6% of the total catch in this study were clupeids (mostly skipjack, gizzard shad and threadfin shad). The numbers of these fish taken in the tow net increased as the water temperature increased above 19°C. Nonclupeid fishes generally represented by temperature increased above 19°C. Nonclupeid fishes were generally represented by temperate basses (*Morone* sp) when the water temperature was below 17.0°C and by crappies (*Pomoxis* spp) when the water temperature was between 19.0 and 22.0°C. (Chilton-ORNL)  
W78-11107

**AN ANALYSIS OF SEASONAL DYNAMICS OF A MIXED POPULATION OF DAPHNIA, AND THE ASSOCIATED CLADOCERAN COMMUNITY,**  
Maryland Univ., College Park. Dept. of Zoology.  
J. D. Allan.  
Freshwater Biology, Vol 7, 1977, p 505-512, 7 fig, 1 tab, 16 ref.

Descriptors: Environmental effects, \*Temperature, Zooplankton, \*Seasonal, Adaptation, Succession.

Results of this study showed rather precise seasonal separation of three cladocerans (*Daphnia*, *Bosmina longirostris*, and *Ceriodaphnia quadrangula*) implying differential adaptations to changing conditions in the lake. *D. ambigua* exhibited a spring peak in abundance followed by a decline which was coincident with a high occurrence of sexual reproduction, the appearance of *D. parvula*, and an increase in *Ceriodaphnia quadrangula*. *Bosmina longirostris* was abundant before and after the period of dominance by *D. ambigua*. It was concluded that temperature rather than species interactions was the more important environmental variable in controlling species succession. (Chilton-ORNL)  
W78-11108

**LARVAL GROWTH AND DEVELOPMENT OF ARGIA VIVIDA (ODONATA: COENAGRIONIDAE) IN WARM SULFUR POOLS AT BANFF, ALBERTA,**  
Calgary Univ. (Alberta). Dept. of Biology.  
G. Pritchard, and B. Pelchat.  
The Canadian Entomologist, Vol 109, No 12, 1977, p 1563-1570, 6 fig, 4 tab, 13 ref.

Descriptors: Environmental effects, Temperature, Photoperiodism, Life history studies, Larvae, Larval growth stage, Aquatic insects.

The role of temperature and photoperiod in the regulation of the life-cycle of *A. vivida* was investigated. Larvae were collected from a variety of places in a warm spring system. Only the Z instar stage can be recognized with certainty but populations can be divided into size classes which appear to correspond well with the last nine larval instars. Field investigations showed that periods of rapid growth occur in fall and spring. Laboratory studies, in conjunction with field results, suggest that, of the physical factors directly controlling the rate of larval development in this species, temperature is the important factor until the penultimate instar, exit from which is under photoperiod control. (Chilton-ORNL)  
W78-11109

**THE IMPORTANCE OF TEMPERATURE CONDITIONING TO THE RESPIRATION OF NATURAL PHYTOPLANKTON COMMUNITIES,**  
New Univ. of Ulster, Coleraine (Northern Ireland). Limnology Lab.  
R. I. Jones.  
British Phycology Journal, Vol 12, September 1977, p 277-285, 6 fig, 19 ref.

Descriptors: pollution, S, \*Phytoplankton

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Descriptors: Environmental effects, \*Thermal pollution, Seasonal, Spring, \*Temperature, \*Phytoplankton, \*Respiration.

During the spring in which these observations were made, the temperature of the water in the bay rose by about 13C, but the rate of warming was erratic due to the shallowness and turbulence of the water mass. Phytoplankton in the bay were therefore subjected to considerable changes in temperature within short periods of time. Respiration rate was not constant but showed changes which could be related to temperature changes. This effect was more pronounced when expressed as per unit of chlorophyll a than when expressed as per unit of algal volume. (Chilton-ORNL) W78-11110

#### SEASONAL SIZE CHANGES IN CERTAIN DIATOMS AND THEIR POSSIBLE SIGNIFICANCE,

Victoria Univ. of Manchester (England). Pollution Research Unit. E. G. Bellingier. British Phycology Journal, Vol 12, September 1977, p 233-239, 6 fig, 1 tab, 12 ref.

Descriptors: Environmental effects, \*Thermal pollution, \*Seasonal, Temperature, Growth rates, \*Diatoms, Size.

Cell size changes in populations of *Stephanodiscus astra* and *Asterionella formosa* were observed throughout the growing season. Population numbers underwent their maximum increase in the spring when water temperature rose from about 4 to 10C. Size restitution seemed to mainly occur during the late autumn and winter and not to any extent during the main growing seasons. These observations are of importance in interpretations of parameters such as cell volume as used in biomass estimates, rates of nutrient absorption, and sinking rates. (Chilton-ORNL) W78-11111

#### A MATHEMATICAL MODEL OF THE ACCUMULATION OF RADIONUCLIDES BY OYSTER (C. VIRGINICA) AQUACULTURED IN THE EFFLUENT OF A NUCLEAR POWER REACTOR TO INCLUDE MAJOR BIOLOGICAL PARAMETERS,

Maine Univ., Walpole. Ira C. Darling Center for Research, Teaching and Service. For primary bibliographic entry see Field 5B. W78-11112

#### THE RECENT HISTORY OF PRODUCTIVITY IN SELECTED BERKSHIRE LAKES,

Massachusetts Univ., Amherst. Dept. of Zoology. S. D. Ludlam. Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 037. Price codes: A04 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRRC Publication No. 90, September 1977. 66 p, 3 tab, 10 fig, 40 ref. OWRT A-077-MASS(2), 14-34-0001-7046.

Descriptors: \*Chlorophyll, Sedimentation rates, \*Trophic level, Degradation(Decomposition), Sediments, \*Massachusetts, \*Productivity, \*Lake sediments, \*Pigments, Eutrophication, \*Berkshire Lakes(Mass), Lakes, Cape Cod Ponds(Mass), \*Mesotrophy, \*Pigment profiles, Oligotrophy.

Seven of the deepest Berkshire lakes were examined to determine their relative trophic type and the concentration of sedimentary pigments most recently deposited. Chlorophyll a and silica uptake in the euphotic zone were used as measures of a lake's trophic type. Fair relationships were observed between euphotic chlorophyll a and the concentration of sedimentary chlorophyll derivatives in the most surficial sediment, and between euphotic chlorophyll a and total sedimentary

carotenoids. These relationships were apparently influenced by climate and the morphometry of the lake basins and watersheds. The recent history of productivity was derived from eight Berkshire lakes and two Cape Cod ponds using pigment profiles from sediment cores. Of the Berkshire lakes, five showed definite signs of recent cultural eutrophication. One showed signs of past eutrophication followed by a decline in productivity, and two showed either a very slight increase in productivity with time or no significant change. Of these lakes, one was eutrophic, six were mesotrophic and one was oligotrophic. Comparison of pigment profiles with other methods of predicting past levels of productivity indicated that it is both an accurate method in the Berkshire lakes and more easily interpreted than diatom profiles. Bacteriochlorophyll degradation products are also useful as an indicator of past anaerobic hypolimnetic conditions in Berkshire lakes. They are better indicators of this conditions than sediment laminae. (Idoine-Mass) W78-11203

#### THE EFFECTS OF ELEVATED LEVELS OF SODIUM IN COMMUNITY DRINKING WATER ON BLOOD PRESSURE DISTRIBUTION PATTERNS,

Massachusetts Univ., Amherst. Div. of Public Health. For primary bibliographic entry see Field 5G. W78-11204

#### BENZIMIDAZOLE FUNGICIDES IN VIRGINIA SOILS: MOVEMENT, DISAPPEARANCE, AND EFFECT ON MICROORGANISMS,

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology. For primary bibliographic entry see Field 5B. W78-11215

#### RECOVERY OF SANITARY-INDICATOR BACTERIA FROM STREAMS CONTAINING ACID MINE WATER,

West Virginia Univ., Morgantown. Water Research Inst. For primary bibliographic entry see Field 5A. W78-11217

#### PHYSICAL, CHEMICAL AND BIOLOGICAL EFFECTS OF DREDGING IN THE THAMES RIVER (CT) AND SPOIL DISPOSAL AT THE NEW LONDON (CT) DUMPING GROUND,

National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center. Naval Facilities Engineering Command, Environmental Assessment Report No. 2, April 1977, 346 p.

Descriptors: \*Dredging, \*Water pollution effects, Connecticut, \*Outer Continental Shelf, \*Ocean dumping, \*Spoil disposal, Dredged material, Biological effects.

The impact of dredging operations on suspended material transport in the lower Thames River Estuary were confined to an area within 300 to 500 yards of the operating dredge and barge, produced an increase in total suspended load within the estuary that was small in comparison to that produced by typical aperiodic storm events, and caused no major alternations in mass transport within the estuary. The physical oceanography of the disposal area showed that turbidity was higher in bottom waters than near the surface and was not restricted to the vicinity of the spoil pile. Maximum transport was in the east/west direction with highest values occurring during the ebb tide. Studies on the effect of dredging and spoils deposition on fecal coliform counts at the disposal site showed that spoil disposal did not increase densities in sediments and bottom waters of the disposal

area. Scuba survey and underwater photography of disposal site indicated that troughs and mounds of newly dumped material provided relief to the normally flat bottom topography and were initially attractive to demersal fish and crustacea. No obvious turbidity was noted at the spoil-water interface during 1.5 knot currents. (Sinha-OEIS) W78-11229

#### LABORATORY AND FIELD STUDIES ON THE LONG-TERM EFFECTS OF PETROLEUM HYDROCARBONS ON BENTHIC MARINE INVERTEBRATES,

Battelle Pacific Northwest Lab., Richland, WA. J. W. Anderson, R. Riley, R. M. Bean, J. W. Blaylock, and S. L. Kiesser. Available from the National Technical Information Service, Springfield, VA 22161 as CONF-770345-1, Report No. BNWL-SA-6169, March, 1977. Presented at Workshop on the Interagency Marine Research Program Associated with Energy Development, held at Newport, RI on March 1-3, 1977. 33 p, 5 fig, 6 tab, 15 ref. EPA - E(45-1):1830.

Descriptors: \*Water pollution effects, \*Benthos, \*Oil pollution, \*Bottom sediments, Aromatic compounds, Outer Continental Shelf, Petroleum hydrocarbons, U.S. Northwest.

The experiments have been useful in demonstrating the differences in the potential persistence of crude oil utilizing undisturbed fine-textured marine sediments under anaerobic laboratory conditions. Furthermore, these experiments have provided sets of samples of development of analytical techniques appropriate not only for use in conjunction with related biological studies of oil-contaminated sediments, but also to studies with related biological studies of oil-contaminated sediments, but also to studies involving the uptake and metabolism of oil by marine organisms. This paper presents data on the uptake of numerous petroleum hydrocarbons by three species present in contaminated sediment held for a long period (40 days) in the natural environment. The extent of hydrocarbon uptake by the two deposit-feeders is demonstrated in contrast to the lack of contamination in Protothaca, which is a filter-feeder. This is probably the most significant approach to determine uptake of hydrocarbons via ingested sediment particles, as all three species were surrounded by oiled substrate. These preliminary findings demonstrate that benthic deposit-feeders take up large molecular weight aromatic compounds from polluted sediment, and these are the hydrocarbons most harmful to marine organisms, as well as vertebrates including man. (Sinha - OEIS) W78-11237

#### DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME I: PROCESSING SYSTEMS SUMMARY,

Dames and Moore, Salt Lake City, UT.; and EIC Corp., Newton, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 913. Price codes: A08 in paper copy, A01 in microfiche. Joint Report to NOAA, Office of Marine Minerals, August 1977. 170 p, 9 fig, 9 tab, 10 ref. 6-35331.

Descriptors: \*Water pollution effects, \*Environmental effects, Mining, \*Manganese nodules, Outer Continental Shelf, Nodules, Ocean mining.

Technological information pertinent to the processing of manganese nodules from the sea floor was prepared to help assess the effects of manganese nodules processing activities on land and marine environments. Potential methods, operations, and requirements for processing and handling manganese nodules on land and at sea are dealt with including recovery of valuable metals,

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5C—Effects Of Pollution

transport of manganese-nodule ore and process wastes, treatment and disposal of wastes, material and energy balances and resource requirements. (Sinha - OEIS)  
W78-11239

**CHEMICAL AND BIOLOGICAL QUALITY OF LAKES FAITH, HOPE, AND CHARITY, AT MAITLAND, FLORIDA, WITH EMPHASIS ON THE EFFECTS OF STORM RUNOFF AND BULK PRECIPITATION, 1971-74.**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
For primary bibliographic entry see Field 5B.  
W78-11259

**NITROGEN REGIME OF SHALLOW EUTROPHIC LAKES ON THE CANADIAN PRAIRIES.**  
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.  
J. Barica.  
Progress in Water Technology, Vol 8, No 4/5, p 313-321, 1977. 5 fig, 2 tab, 18 ref.

Descriptors: \*Eutrophication, \*Lakes, \*Nitrogen cycle, \*Fish farming, \*Fishkill, \*Ammonia, \*Erickson(Manitoba Canada), Shallow water, Dissolved organic nitrogen, Saline lakes, Pothole lakes, Phytoplankton, Algae, Dissolved oxygen, Oxygen depletion, Chlorophyll, Cyanophyta, Ice cover, Agricultural runoff.

Investigation in 1971-74 of the nitrogen cycle in shallow (1-5 m), land-locked, unstratified, eutrophic, moderately saline lakes of the Erickson area of southwestern Manitoba, Canada, showed that ammonia and dissolved organic nitrogen were the most abundant forms of nitrogen. The nitrogen regime was closely associated with oxygen concentration and phytoplankton production. Anoxic conditions resulting from ice cover or the sudden collapse of algal blooms coincided with release of ammonia back into solution in toxic concentrations of 2000-3000 micrograms/l. Ammonia showed a significant inverse relationship to dissolved oxygen and chlorophyll-a. The best correlation was between ammonia at the end of winter and maximum phytoplankton biomass the following summer. These 'pothole' lakes have no permanent inflow or outflow, and are supplied by surface runoff and groundwater seepage. The drainage area is primarily agricultural. Most of the lakes experience regular winterkill due to the ice cover and are thus suitable for summer fish farming, but some develop noxious summer algal blooms and experience high fish mortality during summerkill. Ammonia release can reach toxic levels during summerkill if oxygen depletion is only partial. At a total ammonia concentration of 2000 micrograms/l, pH 9.0, and water temperature of 22°C, the toxic un-ionized ammonia concentration will be 568 micrograms/l, or 2.84 times the acceptable LC50. (Lynch-Wisconsin)  
W78-11278

**ESTIMATED RESPONSES OF LAKE ONTARIO PHYTOPLANKTON BIOMASS TO VARYING NUTRIENT LEVELS.**  
Manhattan Coll., Bronx, NY. Dept. of Environmental Engineering and Science.  
R. V. Thomann, R. P. Winfield, and D. S. Szumski. Journal of Great Lakes Research, Vol 3, No 1-2, p 123-131, October 1977. 8 fig, 3 tab, 10 ref. EPA R 800610.

Descriptors: \*Lake Ontario, \*Nutrients, \*Phosphorus, \*Phytoplankton, \*Biomass, \*Water pollution control, \*Eutrophication, Great Lakes, Lakes, Algae, Model studies, Simulation analysis, Algal control, Nutrient removal, Canada, Nitrogen, Measurement, Analytical techniques, Water pollution sources, Municipal wastes, Industrial wastes, Limiting factors, Water pollution effects.

A simplified model of Lake Ontario phytoplankton dynamics was used to estimate the lake-wide biomass response to various levels of nutrient loading. Simulation analysis demonstrated the importance of the overall loss rates of nutrient, and indicated the open-lake phytoplankton biomass is not in equilibrium with the input nutrient load. For an assumed equilibrium condition, the simulations indicated that reduced load will reduce biomass. Simulation of the 'pastoral load', i.e., that existing prior to man's intense activity, showed that spring phytoplankton levels were 30-70% of present levels, depending on kinetic assumptions (optimistic, reasonable, pessimistic) resulted in a range from a decrease of 25% to an increase of 80% in peak phytoplankton over present levels. Over an implementation period of 10 years, a phosphorus load reduction of about 1-1.5 metric tons/day per year appears to be a sound objective to maintain or reduce phytoplankton levels. The principal sources of nutrients to Lake Ontario are: (1) the Niagara River, including input from Lake Erie; (2) other tributary inputs in the Lake Ontario basin; (3) direct discharges of municipal and industrial wastes; (4) local drainage to the lake; and (5) atmospheric inputs. (Lynch-Wisconsin)  
W78-11279

**MODEL OF PRIMARY PRODUCTION, INCLUDING CIRCULATION INFLUENCES, IN LAKE SUPERIOR.**  
Canada Centre for Inland Waters, Burlington (Ontario).  
D. C. L. Lam, and E. Halfon.  
Applied Mathematical Modelling, Vol. 2, No. 1, p 30-40, March 1978. 15 fig, 5 tab, 27 ref.

Descriptors: \*Lake Superior, \*Circulation, \*Model studies, \*Primary productivity, \*Hydrodynamics, Lakes, Great Lakes, Stratification, Winds, Waves(Water), Phosphorus, Nutrients, Plankton, Water temperature, Currents(Water), Oligotrophy, Ecology, Drag, Drag coefficients, Simulation analysis, Analytical techniques, Eutrophication.

A finite-difference hydrodynamic model developed by Simons was used to compute the flow regimes of Lake Superior in 1973. Results confirmed the generally counterclockwise circulation patterns observed during summer stratification. Preliminary results of applying a variable drag coefficient based on a wind-wave coupling model for a stormy period are presented. A two-compartment ecological model was used in which transformation from one compartment (soluble reactive phosphorus) into the other (particulate phosphorus) is controlled by a primary production submodel. Application showed that a physical model should always be included with the ecological model because the distribution of biological activity is influenced by current patterns, influenced in turn by temperature and nutrient distribution. The model constant,  $K_{sub}$ , identifies the concentration of soluble reactive phosphorus at which the photosynthesis rate is half of maximum production. The value of the constant is 0.78 mg/cu m, computed by observing that maximum production occurs at a soluble reactive phosphorus concentration of 0.98 mg/cu m. Reference data was collected during six cruises May-November 1973 at over 200 stations. Some 40 physical, chemical, and biological variables were sampled. (Lynch-Wisconsin)  
W78-11280

**SEASONAL AND HORIZONTAL DISTRIBUTIONS OF PLANKTONIC CRUSTACEA IN GEORGIAN BAY AND NORTH CHANNEL, 1974.**  
Waterloo Univ. (Ontario) Dept. of Biology.  
J. C. H. Carter, and N. H. F. Watson.  
Journal of Great Lakes Research, Vol. 3, No. 1-2, p 113-122, October 1977. 6 fig, 2 tab, 9 ref.

Descriptors: \*Georgian Bay(Lake Huron Ontario Canada), \*North Channel(Lake Huron Ontario Canada), \*Crustaceans, \*Zooplankton, \*Distribution patterns, \*Copepods, \*Cladocerans, Canada, Ontario(Canada), Lake Huron, Seasonal, Horizontal distribution, Species composition, Bays, Water temperature, Cyclops bicuspidatus thomasi, Currents(Water), Eutrophication.

A high abundance of cladoceran zooplankton found in Georgian Bay and North Channel (Lake Huron, Ontario, Canada) was probably caused by warm surface waters accumulated there in late spring and early summer; copepod horizontal distribution, probably dependent on transport by water currents, showed no positive relationship to water temperature. Sampling was carried out April-December 1974 on seven synoptic cruises at 46 stations. One vertical haul was taken at each station from two m above the bottom to the surface with a conical plankton net of 40-cm mouth diameter and a No. 25 nylon mesh with 64-micrometer apertures. Abundance was quantified on a areal basis because the great majority of planktonic crustacea are found in the upper 25-30 m, and volumetric quantification would give misleading high figures for shallower stations. Eleven species of cladocerans and 12 of copepods were found; Cyclops bicuspidatus thomasi comprised over 50% of all specimens. Mean summer abundance of planktonic crustacea (61.8/sq cm) was slightly higher than in Lake Superior in 1968 (43/sq cm) but much lower than in other parts of Lake Huron during 1968 (167/sq cm). Planktonic crustacea may be related to total annual phosphorus loading. Each of the three major groups—cladocerans, calanoid copepods, and cyclopoid copepods—showed distinctive patterns of seasonal horizontal distribution, details of which are presented in the paper. (Lynch-Wisconsin)  
W78-11282

**FEEDING BY AN OMNIVOROUS PLANKTONIC COPEPOD AETIDEUS DIVERGENS.**  
BRADFORD, Washington Univ., Seattle. Dept. of Oceanography.  
S. B. Robertson, and B. W. Frost.  
Journal of Experimental Marine Biology and Ecology, Vol. 29, No. 3, p 231-244, October 1977. 3 fig, 2 tab, 46 ref. NSF GA-25385 and DES 74-22640.

Descriptors: \*Copepods, \*Aetideus divergens, \*Feeding rates, \*Zooplankton, \*Particle size, Diatoms, Phytoplankton, Artemia, Crustaceans, Larvae, Food webs, Omnivores, Trophic level, Calanoid copepods, Puget Sound(WA), Washington, Thalassiosira fluviatilis, Coscinodiscus angustii, Calanus pacificus, Eucheta elongata, Model studies.

Adult females of the omnivorous calanoid copepod Aetideus divergens were used in laboratory experiments to study patterns of feeding on various sizes and concentrations of diatoms, and on freshly hatched nauplii of the crustacean Artemia. A. divergens fed most efficiently on the largest size of diatom and on Artemia nauplii, but was notably inefficient at feeding on small diatoms, even at very high concentrations. A. divergens differs in this respect from filter-feeding copepods such as calanus pacificus. A. divergens and its congeners usually occur at subsurface depths not far below the mixed layer and seem adapted for feeding on large particles, possibly large phytoplankton and fecal pellets. Seawater and copepods were obtained at a depth of about 230 m in central Puget Sound near Seattle, Washington. In diatom feeding experiments three sizes of Thalassiosira fluviatilis and Coscinodiscus angustii were used. One hundred female A. Divergens were placed in each of several four-liter beakers containing 3800 ml filtered seawater and specific concentrations of diatoms. Beakers were kept at 12°C in continuous dim light. Several



models, including the Ivlev curve and Michaelis-Menten equations, were considered in analyzing feeding behavior of *A. divergens*. Swimming behavior of *A. divergens* is compared with that of two other Puget Sound copepod species, the filter-feeder *C. pacificus*, and the carnivore *Euchaeta elongata*. (Lynch-Wisconsin)  
W78-11283

# TRACE METAL CONCENTRATIONS AND PARTITIONING IN ZOOPLANKTON, NEUSTON, BENTHOS FROM THE SOUTH TEXAS OUTER CONTINENTAL SHELF, TEXAS A AND M UNIV., COLLEGE STATION. DEPT. OF OCEANOGRAPHY.

A. Horowitz, and B. J. Presley.  
Archives of Environmental Contamination and Toxicology, Vol. 5, No. 2, p 241-255, 1977. 1 fig, 2 tab, 27 ref.

Descriptors: \*Gulf of Mexico, \*Continental shelf, \*Zooplankton, \*Heavy metals, \*Benthos, \*Neuston, Trace elements, Sargassum, Food chains, Bioaccumulation, Partitioning, Fish, Shrimp, Squid, Sediments, Path of pollutants, Copepods, Ostracods, Larvacea, Baseline studies.

Biological samples of zooplankton, surface plankton, sargassum, and benthos obtained at 12 stations on the south Texas outer continental shelf were analyzed for copper, zinc, cadmium, lead, chromium, nickel, iron, and manganese to establish both baseline metal concentrations and partitioning among parts and organs of the individual organisms. Benthos samples were primarily squid, shrimp, and fish. Chemical analyses showed shrimp exoskeletons and the skin of squid and fish generally contained higher metal levels than the flesh, probably due to adsorption from seawater and/or an internal detoxification procedure employed by the organism. Squid 'pens' contained higher levels of copper, cadmium, zinc, lead, and iron than skin or flesh, also probably the result of internal detoxification or as a means of storing necessary metabolites in the case of copper and zinc. Adsorption is not a factor as the pen is not directly exposed to seawater. A north-south directional increase in lead concentrations in organisms and an increase in cadmium from nearshore to offshore agrees with spatial distribution patterns in sediments. Statistical analysis of chemical and biological data indicates that relatively small changes in biological makeup of the sample can markedly affect concentrations of lead, cadmium, nickel, and zinc. Fish and shrimp contained some of the lowest metal levels of biota examined. All lead can be accounted for by copepods, ostracods, and larvacea. (Lynch-Wisconsin)  
W78-11285

# FINE STRUCTURE OF ENCYSTMENT OF THE QUADRIFLAGELLATE ALGA, POLYTOMELLA AGILIS.

Ottawa Univ. (Ontario). Dept. of Biology.  
D. L. Brown, G. G. Leppard, and A. Massalski.  
Protoplasma, Vol. 90, 1976, p 139-154. 17 fig, 28 ref.

Descriptors: \*Polytomella agilis, \*Plant morphology, Structure, \*Encystment, \*Cysts, \*Algae, Electron microscopy, Quadriflagellates, Cytological studies, Methodology, Cell walls, Chlorophyceae, Desiccation.

Morphological changes accompanying encystment of the quadriflagellate alga *Polytomella agilis*, analyzed by using electron microscopy, are described. Subsequent redifferentiation of the swimming cells during encystment is discussed in a companion paper. In exponentially growing cultures *P. agilis* exists as a free-swimming, colorless quadriflagellate lacking a cell wall, which reproduces rapidly by binary fission. As the population enters the stationary growth phase (after about 40 hrs) increasing numbers of cells become

thick-walled, immotile cysts resistant to desiccation, which germinate if placed in fresh medium. During encystment—which takes about 20 hrs—the unicells lose their flagella, sink to the bottom, and form a thick, four-layered cell wall. Proliferation of rough endoplasmic reticulum and Golgi bodies is seen in early stages, followed by reduction in size or number of these organelles and of plastids in the maturing cyst. Microtubular structures differentiate and are not observed in later stages of encystment. Six stages are distinguished: (1) Flagella absent, cells rounded, prominent large starch grains. (2) Cells smaller and completely rounded, cytoplasm denser with many free ribosomes, nucleolus diffuse, plastid highly reticulate, appearance of very thin wall layer. (3) First discrete wall layer, large and compact nucleolus. (4) Second wall layer inside first, Golgi bodies more evident. (5) Third wall layer. (6) Final wall layer with invaginations. (See also W78-11287) (Lynch-Wisconsin)  
W78-11286

# FINE STRUCTURE OF ENCYSTMENT OF THE QUADRIFLAGELLATE ALGA, POLYTOMELLA AGILIS.

Ottawa Univ. (Ontario). Dept. of Biology.  
D. L. Brown, A. Massalski, and G. G. Leppard.  
Protoplasma, Vol. 90, 1976, p 155-171. 15 fig, 15 ref.

Descriptors: \*Polytomella agilis, \*Plant morphology, \*Structure, \*Encystment, \*Cysts, \*Algae, Electron microscopy, Quadriflagellates, Methodology, Cytological studies, Cell walls, Chlorophyceae, Flagella.

Encystment by the quadriflagellate alga *Polytomella agilis* was studied using electron microscopy. Encystment is described in a companion paper. The alga develops a four-layered cell wall during encystment, following a free-swimming exponential growth stage. In encystment, which takes 30-40 min, each germinating cyst releases a single, fully differentiated, flagellated swimming cell. A new method of purifying populations of mature cysts resulted in up to 90% encystment, compared with <2% in previous studies. Cysts were harvested from cultures after 7-10 days of growth. The medium was removed, and clumps of cysts and debris on the bottom broken up by vortex agitation. After cysts were removed by low-speed centrifugation, denser mature cysts pelleted. The pellet was suspended in fresh medium, again agitated and centrifuged, resuspended in fresh medium, and incubated at 25°C. About 50% encysted in 3-7 hrs, and up to 90% in 18 hrs. During the first three hrs the cysts grow bigger (due apparently to water uptake), and a polarity is established in the cytoplasm. Release involves selective degradation of part of the cyst wall, followed by physical rupturing. Cytoplasmic organelles seen to de-differentiate during encystment are completely re-differentiated during encystment. The encystment stimulus appears to be replacement of the old conditioned medium with fresh medium, and is not dependent on nutrient replacement. (See also W78-11286) (Lynch-Wisconsin)  
W78-11287

# ELECTRON-OPAQUE MICROSCOPIC FIBRILS IN LAKES: THEIR DEMONSTRATION, THEIR BIOLOGICAL DERIVATION AND THEIR POTENTIAL SIGNIFICANCE IN THE REDISTRIBUTION OF CATIONS.

Canada Centre for Inland Waters, Burlington (Ontario).  
G. G. Leppard, A. Massalski, and D. R. S. Lean.  
Protoplasma, Vol. 92, 1977, p 289-309. 14 fig, 63 ref.

Descriptors: \*Fibrils, \*Lakes, \*Cations, \*Electron microscopy, \*Algae, \*Lake Ontario, Cytological studies, Ions, Nutrients, Dissolved organic carbon, Particulates, St. George Lake (Ontario)

Canada), Ontario (Canada), Canada, Bay of Quinte (Ontario, Canada), Phytoplankton, anabaena, Microcystis aeruginosa, Scenedesmus basilensis, Navicula pelliculosa, Nitzschia kuetzingiana, Stigeoclonium.

An abundant, persistent, electron-opaque, fibrillar material of high surface-to-volume ratio was identified as an important component of the water of two lakes using electron microscopy. The behavior and contact relations of fibrils and aggregates suggest they play a role in contact cation exchange, a hypothesis bolstered by a composition of 20-30% uronic acid residues. Analyses of purified fibril preparations show physical characteristics appropriate to the principal component of a hypothetical organic carrier system for redistribution of bound, but biologically available, cations in lakes. The non-rigid fibrils (3-10 nm in diameter) were found on the surfaces of common lakes algae and microbes, free in the water column, and free on the lake bottom. Filtration experiments and microscopy indicate the fibrils are readily lost by cells without cell damage. Fibrils may form meshlike aggregates which can separate and reassociate, and which also adhere to cells and large suspended particles. Water and sediment samples taken from St. George Lake near Toronto, Ontario, Canada, were centrifuged to yield a heterogeneous pellet of small and fine particles, and then prepared for transmission electron microscopy. Water samples from limnocorral no. 3 in the Bay of Quinte in northern Lake Ontario were also analyzed. Experiments were conducted with cultures of eight species of algae obtained from various sources. (Lynch-Wisconsin)  
W78-11288

# THE VERTICAL AND SEASONAL DISTRIBUTION OF CHLOROPHYLL IN LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO: IMPLICATIONS FOR PRIMARY PRODUCTION ESTIMATES, Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.

E. J. Fee.  
Limnology and Oceanography, Vol. 21, No. 6, p 767-783, November 1976. 12 fig, 32 ref.

Descriptors: \*Primary productivity, \*Fluorometry, \*Phytoplankton, \*Chlorophyll, \*Methodology, \*Distribution patterns, \*Experimental Lake Area (Ontario, Canada), Ontario (Canada), Canada, Lakes, Stratification, Fertilization, Nutrients, Eutrophication, Algae, Depth, Carbon radioisotopes, Measurement, Seasonal, Vertical distribution.

Use of an in-vivo flow-through fluorometry system in the Experimental Lakes Area of northwestern Ontario, Canada, revealed narrow bands of very high chlorophyll concentrations in the metalimnia or hypolimnia of all clear, stratified ELA lakes. A large error may therefore be associated with estimating primary production on the basis of samples taken at discrete depths, which can miss the narrow bands of high phytoplankton biomass. In addition in many lakes results supporting the classical theory of the generation of autumn phytoplankton blooms probably stem from sampling at discrete depths. In two experimentally fertilized lakes chlorophyll concentrations in the hypolimnion exceeded 300 micrograms/l while epilimnetic chlorophyll was only three micrograms/l. The hypolimnetic bloom represented the major response to enhanced nutrient loading. The peak was in or below the thermocline at depths where 2-3% of photosynthetically available surface irradiance penetrated; algae at the peak were actively growing flagellated colonial chrysophytes. The autumn surface bloom was due to entrainment of this previously produced chlorophyll, not to growth caused by mixing in of hypolimnetic nutrients. Chlorophyll fluorescence as a function of depth sensitive photomultiplier, and a recorder. Using a rubber hose connected to a submersible pump, the

### Group 5C—Effects Of Pollution

Observation of distribution patterns of chlorophyll-a at a deep offshore station in Lake Michigan March 1973 to December 1974, showed a deep chlorophyll-a maximum, a factor of importance in future investigations of food chains and eutrophication in the Great Lakes. Chlorophyll-a concentrations increased uniformly at all depths during spring, reaching 3-4 mg/cu m by late May. Thermal stratification was followed by development of a subthermocline chlorophyll peak between 10 and 30 m that reached 8.5 mg/cu m by late July. The major subthermocline peak collapsed in mid-August, but was followed by two lesser peaks at 10 and 30 m. Autumn mixing dispersed these peaks in the mixed layer, increasing epilimnetic chlorophyll at a time when integral chlorophyll levels were declining. At fall overturn chlorophyll was uniformly distributed at concentrations of about 1 mg/cu m, and remained at this level throughout the winter. Samples were collected from shipboard at a 140-m deep station on 45 cruises at about biweekly intervals. The

In laboratory feeding experiments with five species of tropical planktonic copepods, the relation

SEASONAL VARIATIONS IN SALT-MARSH  
MACROALGAE PHOTOSYNTHESIS. II. FUCUS  
VESICULOSUS AND ULVA LACTUCA,  
State Univ. of New York at Stony Brook. Marine  
Sciences Research Center.  
B. H. Brinkhuis.  
Marine Biology, Vol. 44, No. 2, p 177-186, 1977. 6  
fig. 25 ref.

Swine overlaid the wastewater analysis. Suspended solids removed to 32% efficient, and spent nitrate for ammonia a very efficient of the 'overlaid' removal W7K-

Descriptors: \*Fucus vesiculosus, \*Ulva lactuca, \*Salt marshes, \*Photosynthesis, \*Flax Pond(NY), \*Light intensity, Seasonal, Algae, Carbon radioisotopes, Chlorophyll, Biomass, Pigments, Solar radiation, Ascophyllum nodosum, Intertidal areas, New York.

A study of the role of natural irradiation patterns in determining seasonal photosynthetic variations in the macroalgae *Fucus vesiculosus* and *Ulva lactuca* collected at Flax Pond, New York, showed maximum photosynthesis occurred in spring and summer. Photosynthetic capacity, evaluated by carbon-14 uptake, was closely related to seasonal irradiation patterns and changes in field biomass in both species. Photosynthesis measured by dry weight was higher in *U. lactuca*, while photosynthesis by chlorophyll-a was equal in the two species. Photosynthetic capacity was inversely related to pigment content. Maximum chlorophyll-a concentrations occurred during winter. Frond profile studies with *F. vesiculosus* indicated that apices always exhibited greatest photosynthetic capacity. *F. vesiculosus* showed greater carbon-14 uptake in the ethanol-soluble fraction, while *U. lactuca* exhibited greater activity in ethanol-insoluble fractions. Intertidal specimens of *F. vesiculosus* were obtained from a saxicolous population on the northern edge of a marsh embankment at Flax Pond, on Long Island, 0.2 m above mean low water. Subtidal specimens of *U. lactuca* were collected from the rocky substratum in the marsh's inlet at -0.5 m below MLW. Specimens were collected March 1973-July 1974 at 4-6 wk intervals. Incubations were conducted at light intensities of 4.73, 6.37, 8.48, and 9.82 g cal/sq cm/hr. (Lynch-Wisconsin) W78-11297

## 5D. Waste Treatment Processes

**LIQUID AND WATERBORNE WASTES RESEARCH IN NEW ZEALAND 1976**, National Water and Soil Conservation Organization, Christchurch (New Zealand). For primary bibliographic entry see Field 5B. W78-10530

**RUGGED SELF-PRIMING PUMPS**. For primary bibliographic entry see Field 8C. W78-10548

**SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE**, Alcorn State Univ., Lorman, MS. H. E. Grier, G. C. Gupta, and S. C. Tiwari. Journal of the Environmental Engineering Division, Proceedings of ASCE, Vol. 103, No. EE4, p 551-556, August, 1977. 2 fig, 1 tab, 11 ref.

Descriptors: Ammonia, Nitrates, Nutrients, Suspended solids, \*Waste water disposal, Waste water treatment, Effluents, \*Salt removal(Wastes), \*Swine wastes, Farm wastes.

Swine waste aerobic lagoon effluent was sprinkled overland and the runoff water was collected. Both the waste effluent and the runoff water were analyzed for nitrate, ammonia, chloride, suspended solids, BOD, and specific conductance. Removal efficiency of nitrate dropped from 62% to 32% on prolonged disposal of swine waste effluent, in six months. Data for suspended solids and specific conductance support these results for nitrate removal efficiency. Removal efficiencies for ammonia and chloride were higher and showed a very small decrease with time. BOD removal efficiency was 95% throughout the six-month period of the study. The system showed signs of 'overloading' for nitrate removal but not for BOD removal. (Skogerboe-Colorado State) W78-10586

**NEW JERSEY PLANT TO TURN SLUDGE INTO COMPOST**. Solid Wastes Management, Vol 21, No 5, p 12, May, 1978. 1 fig.

Descriptors: \*Biodegradation, \*Sludge treatment, \*Aeration, \*Sewage bacteria, \*Humus, Wood wastes, Sewage sludge, Decomposing organic matter, Equipment, Design data, Municipal wastes.

The \$2.1 million sludge composting plant in Camden, New Jersey, will reduce sludge treatment costs to \$35/dry ton from the \$109/wet ton cost associated with ocean disposal. The pilot plant was constructed with a design developed by the United States Department of Agriculture's Beltsville, Maryland, research facility. The sludge is mixed with wood chips in a 1:2 ratio by volume and deposited on a compost pad. The compost pad is underlined with a piping system to draw air through the sludge. The sludge and wood chip pile is covered by a layer of recycled wood chips or composted sludge. After three days, the sludge reaches a temperature of 160-170 F. The compost pile is dismantled after 21 days and allowed to cure for an additional 30 days. The compost is then separated from the wood chips, which are reused. The high composting temperature kills pathogenic bacteria; the pilot plant has a 15 ton/day sludge capacity. (Lisk-FIRL) W78-10598

**NEW CONCEPT CLAIMED FOR SEWAGE AERATION**. Journal of the Institution of Engineers (Australia), Vol. 50, No. 7, p 56, April, 1978.

Descriptors: \*Aeration, \*Turbines, \*Submergence, \*Pumps, \*Aerated lagoons, Activated sludge, Oxidation lagoons, Sludge digestion, Biological treatment, Flotation, Equipment, Design data, Waste water treatment, Municipal wastes.

Pacific Pumps has begun distribution in Australia of submersible turbine aerators suitable for activated sludge, aerobic digestion, sludge oxidation lagoons, and flotation processes. The aerator turbine, with a Frogman submersible motor, does not rely on a fan or compressor. Waste water is drawn into the turbine through an intake at the base; the effluent is mixed with air drawn in through a tube. The high speed rotation of the turbine provides thorough mixing; air and waste water are discharged automatically. Units are manufactured with capacities ranging over 25 cu m/hr to 200 cu m/hr; motor sizes range over 1.5-11 kilowatts. Due to the high oxygen intake and absorption values achieved by the aerators, these units are reportedly suitable for high strength sewage and industrial wastes. (Lisk-FIRL) W78-10609

**OXYGEN INJECTION SYSTEM**. Effluent and Water Treatment Journal, Vol. 18, No. 6, p 289, June, 1978. 1 fig.

Descriptors: \*Oxygenation, \*Aeration, \*Injection, \*Dissolved oxygen, \*Oxygen sag, Reaeration, Oxygenation, Activated sludge, Seasonal, Pumps, Nozzles, Equipment, Waste water treatment, Municipal wastes.

BOC Vitox oxygen injection systems have been installed as an alternative to plant expansion in several English waste water treatment plants where aerators were overloaded. The Vitox system, supplied with liquid oxygen in vacuum insulated containers, injects oxygen into activated sludge tanks when dissolved oxygen levels fall below a preset level. Oxygen is mixed with process liquor, pressurized to 2-3 bars in a venturi-type blender; the mixture is pumped to the oxygen deficient area. The bubble-bearing liquid is discharged through a high velocity expansion nozzle which

shatters the oxygen bubbles to a readily dissolvable size as they are released with the liquid. The Vitox system promotes rapid mixing and 95% oxygen dissolution. One kg of BOD is removed for each kg of oxygen; oxygen may also be generated on-site rather than supplied in contained liquid form. Several Vitox systems already in use augment aerators during diurnal or seasonal peaks, reduce odor problems at plant inlets, and reoxygenate contaminated rivers. (Lisk-FIRL) W78-10612

**EFFLUENT OIL COLLECTING VESSEL**, Mitsubishi Jukogyo Kabushiki Kaisha, Tokyo (Japan). (Assignee). S. Uchida, H. Takeshita, and S. Yamazaki. United States Patent 4,100,072. Issued July 11, 1978. Official Gazette of the United States Patent Office, Vol. 972, No. 2, p 718, July, 1978. 1 fig.

Descriptors: \*Oily water, \*Oil wastes, \*Patents, \*Floats, \*Pontoons, Separation techniques, Oil pollution, Hydraulic structures, Waste water treatment, Industrial wastes.

A patent has been issued for a floating pontoon vessel used to separate effluent oil from the surface of a body of water. The floating parallel hulls have an oil converging mechanism which collects oil and water at the bow of the vessel. The oil and water are directed towards the mechanism by a series of flexible guides and passed to a suction pipe located on one of the floats. A high pressure ejector, connected to a water source, directs a pressurized flow of water towards the effluent in the converging mechanism; the suction pipe, with its open end at the water level, removes the oil from the effluent by means of an ejector. The effluent oil is transferred to a storage tank. (Lisk-FIRL) W78-10618

**THROUGH A GLASS DARKLY**. Effluent and Water Treatment Journal, Vol 18, No 6, p 295, June, 1978. 2 ref.

Descriptors: \*Anion exchange, \*Resins, \*Ion transport, \*Cation exchange, \*Polymers, Fouling, Organic wastes, Inorganic compounds, Separation techniques, Porosity, Waste water treatment, Municipal wastes.

Fouling potentials and prevention methods are discussed for anion exchange resins. The presence of organics and a high organic-to-inorganic dissolved ion ratio in the influent can lead to fouling, breakthrough, high organic loading, and a high residual on the anion exchange resin. When waste water containing fulvic or humic acids with a high inorganic ion concentration is treated on a cation/anion exchange system, subsequent anion exchangers, especially in mixed beds, may be damaged. Anion exchangers with a high reversibility to organics and a large total available capacity will perform more efficiently and resist organic accumulations. Weak bases are preferred over strong bases for resistance to organics. Gels rather than macroreticular resins provide higher capacities. Mixed bed operations have shown the highest susceptibility to fouling by acid fixation of the organics. Matrix and macroporosity have improved weak and strong base resins; physical stability, bead integrity, bead shape, and hydraulic properties are considered the important parameters in macroporous resins. Backwash characteristics and organic reversibility by polymers are considered important features of anion exchange resins. (Lisk-FIRL) W78-10656

**A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM**, Instituto Venezolano de Investigaciones Cientificas, Caracas. Lab. de Ingenieria Ambiental. For primary bibliographic entry see Field 5G. W78-10661



### Group 5D—Waste Treatment Processes

A. B. S. Alam, and D. I. Angelbeck.  
Journal of the Water Pollution Control Federation,  
Vol. 50, No. 7, p 1786-1803, July 1978. 14 fig, 9 tab,  
17 ref

**Descriptors:** \*Activated sludge, \*Waste water treatment, \*Water pollution control, \*Optimization, \*Simulation analysis, Hydraulics, Rates, Mass balance equation, Data collections, Computer models, Operations research, Variational calculus.

A computer simulation of optimal control techniques for a laboratory-scale activated sludge system consisting of a complete-mix reactor and a clarifier has been demonstrated. The model included: two state variables--(a) dilution factor and (b) sludge wastage rate; and two disturbance variables--(a) influent microorganism level and (b) influent substrate level. The model consisted of the two basic equations derived through microbial solids and substrate mass balances in the aerator and the clarifier and a connecting equation defining the sludge settling character as a function of sludge volatile fraction and applied load factors. The linearized process performance defined by the deviations of state variables and the overall performance function were minimized using variational calculus techniques. The optimal solution of the linearized system equations related by the new connecting function generated the optimal control schedules of influence flow rate, sludge wastage rate, and sludge recycle rate. Measured system performance was compared with the computer-simulated predicted values; the theoretical system models were found to closely represent the operational system. The simulation demonstrated that substantial reduction in effluent quality variation caused by an influent substrate disturbance is possible by using optimal control strategies. (Bell-Cornell)

A. R. Jacobson.  
Public Works, Vol. 109, No. 7, p 94, July, 1978.

Descriptors: \*Sodium compounds, \*Lime, \*Anaerobic digestion, \*Methane bacteria, \*Methane, Alkalinity, Ammonia, Carbon dioxide, Sludge digestion, Waste water treatment, Sludge treatment. Municipal wastes.

Lime and sodium bicarbonate treatment of anaerobically digested sludge provides the optimum pH for methane-forming bacteria. A natural buffer system established by digesters is based on bicarbonate alkalinity from the reaction of ammonia and carbon dioxide to form ammonium bicarbonate. The optimum pH for growth of methane-producing bacteria is in the range of pH 7.0. Lime will adjust the pH of the digester to 6.3-6.5. Sodium bicarbonate further increases the pH to 7.0-7.4. When digester bicarbonate alkalinity falls below 2,500 mg/liter, a 1,500 lb/million gal sodium bicarbonate addition will increase the alkalinity by 180 mg/liter. Treatment with sodium bicarbonate in addition to lime prevents lime overdose or localized pH variations. (Lisk-FR1.)

W78-10671

Ciba-Geigy, Basel (Switzerland).  
British Patent No. 1,491,722. November 16, 1977.  
12p. 19 claims. 3 tab.

**Descriptors:** \*Pulp wastes, \*Waste water treatment, \*Ion exchange, \*Patents, Wastes, Industrial wastes, Waste treatment, Water pollution treat-

ment, Water pollution sources, Pulp and paper industry, Textiles, Color, Anions, Anion adsorption, Leather industry, Effluents, Polyamides, Polymethacrylics, Acrylic polymers, Amino polymers, Sulfite pulp, Asbestos, Ion exchange, Ion exchangers.

A process is provided for purifying industrial effluents, particularly for decoloring waste waters in the textile, paper, and leather industries. The process comprises bringing the aqueous effluent into contact with an adsorbent capable of removing anionic substances (e.g., dyes, optical brighteners) from the waste water. The adsorbent comprises a carrier which has been treated with a combination of a basic nitrogenous polymer and a polyanionic polymer. For example, the carrier can comprise equal parts of asbestos and bleached sulfite pulp, treated first with a polyamidopolyamine (derived from linoleic acid/linoleic acid and triethylenetetramine) and then with polymethacrylic acid. (Lynch-IPC) W78-10672

Environmental Protection Service, Burlington  
(Ontario). Waste Water Technology Centre.  
H. D. Monteith, and I. P. Stephenson

Canadian Environmental Protection Service,  
Research Report No. 71, 141 p, 1978. 26 fig, 72 ref,  
19 tab

**Descriptors:** \*Sludge, \*Testing procedures, Water pollution sources, Wastes, Canada, Nutrients, Heavy metals, Physical properties, Data processing, Anaerobic digestion, Sludge digestion, Foreign countries, Sampling, Monitoring.

Anaerobically digested liquid sludges from five Ontario water pollution control plants were examined to identify the sources of constituent variability (nutrient, heavy metals, physical characteristics) by determining whether variations arose from sample handling and methods of analysis, from changes in composition with time, or from inherent sludge heterogeneity. Familiar methods of data reduction (graphic time sequences, probability plots averages, confidence limits, etc.) have been combined with more rigorous methods of data analysis (analysis of variance, time series analysis) to assist in data interpretation. The results are fundamental for establishing efficient sampling programs to monitor nutrient and undesirable contaminant discharges in sludges destined for disposal. (Witt-IPC)

Water and Sewage Works, Vol. 125, No. 7, p 27, July, 1978.

Descriptors: \*Oxidation, \*Odor, \*Sulfides, \*Gases, \*Corrosion control, Air pollution, Sewerage, Treatment facilities, Low flow, Sewers, Pipelines, Pumping plants, Waste water treatment, Municipal wastes.

Hydrogen peroxide was injected into force mains, pumping stations, and wet wells to reduce sulfide odors and corrosion problems at the Manatee County, Florida, waste water treatment plant. Odors, especially prevalent during the summer months, were attributed to water temperatures up to 85C, a relatively flat sewer system layout, and low flow in sewers in certain areas. Paint on some houses near the plant was actually discolored by the hydrogen sulfide gas. Du Pont's Tysul WW hydrogen peroxide was injected by metering pumps into 12 sites located along the sewer system. The hydrogen peroxide was stored at the sites in 500 gal tanks. Chlorine injections of 100-200 ppm into lift station lines provided only tempo-

rary relief; permanganate and chemical injections were also ineffective. Hydrogen peroxide injection also eliminated corrosion problems; the cost of the deodorization system was an estimated \$5/yr/residence. (Lisk-FIRL)  
W78-10675

BLEACHED EFFLUENT TREATMENT,  
CIP Research Ltd., Hawksbury (Ontario).  
F. M. A. Nicolle, and R. Shamash.  
Canadian Forestry Service, Ottawa, Ontario K1A  
0H3. Cooperative Pollution Abatement Research  
(CPAR) Project Report 187-3, Final Report to  
March 31, 1976. 28 p. 5 fig. 3 ref. 9 tab.

**Descriptors:** \*Bleaching wastes, \*Waste water treatment, Wastes, Industrial wastes, Waste pollution, Water pollution treatment, Water pollution sources, Pulp and paper industry, Pulp wastes, Lime, Chemical precipitation, Salts, Calcium, Softwood, Color, Toxicity, Fish, Sludge disposal, Burning, Chemical oxygen demand, Hydrogen ion concentration, Kraft mills. Clarifiers.

A major obstacle in lime treatment of pulp mill bleachery effluents for color removal has been the poor settleability of the lime sludge. More rapid settling was achieved by a 3-stage process (mixing of chlorination/chlorine dioxide and first extraction stage effluents, addition of lime, and treatment with carbon dioxide to pH 7), but this process required 3 separate clarifiers. A simplification requiring only one clarifier has been discovered, based on the finding that lime settles rapidly if soluble Ca salts are present when the lime is added to the extraction-stage effluent. Soluble Ca salts can be obtained by dissolving a small amount of lime in the chlorination effluent prior to mixing with the extraction-stage effluent. A continuous operation in a pilot plant of 20 liter/hr capacity was found feasible, using effluents from CEDED-bleached softwood kraft pulps. This study confirmed that 80-85% of the color from total bleach plant effluent can be removed in a single stage of lime additions varying from 90 to 120 lb/air-dry ton of pulp (in presence of soluble Ca salts). At the same time, COD and total organic carbon are reduced 40%, and fish toxicity is improved from LC(50) of 37% to 50-100%. For the settling of treated effluent, a clarifier with an overflow rate of 200 U.S. gal/day/sq ft (or 8.1 cu m/day/sq m) would be needed. It is suggested that the lime sludge be burned in the lime kiln (after thickening in a separate filter) or with the lime mud from the causticization. The lime makeup due to Ca lost in the effluent is about 20-30 lb or 10-15 kg/air-dry ton. (Brown-IPC) W78-10676.

For primary bibliographic entry see Field 5B.

W 78-10677

**PULP MILL EFFLUENTS,**  
British Columbia Forest Products Ltd., Macken-  
zie.

A. Twa, and R. J. Reis.  
Canadian Forestry Service, Ottawa, Ontario K1A  
OH3. Cooperative Pollution Abatement Research  
(CPAR) Project Report 371-2, Final report to Sep-  
tember 30, 1976. 23 p. 3 fig. 5 ref. 1 tab.

Descriptors: \*Pulp wastes, \*Chemical precipitation, \*Waste water treatment, Wastes, wastes, Water pollution sources, Industrial Lignins, Biochemical oxygen demand, Biomass, Water pollution treatment, Suspended solids, Calcium, White water(Paper machines), Pulp washing, Countercurrent washing, Kraft mills, Biological treatment.

The installation of an additional countercurrent brown stock washer (downstream from a diffusion washer and knotters but ahead of pulp screens) reduced unbleached white water losses from 55 to 124 lb/air-dry ton (as saltcake). The washer operated at 81% efficiency. After purging the high-washing-loss effluent from the biological treatment basin, suspended solids (mainly calcium-lignin precipitates) dropped from 240 to 87 ppm (24 lb/air-dry ton, compared to a previous average of 74 lb.). Suspended solids generation is attributable largely to biomass, and 75% of suspended solids are settleable within 8 hr. In a mill trial with a 6-hr quiescent zone, at least 50% of these solids could be removed. Reduced washing losses decreased the 5-day BOD loading to the basin by 40%; as a result, the BOD reduction across the basin improved from 80% to 88%. Further benefits included chemical savings in nutrients, saltcake makeup, bleach consumption, and defoamer use. (Brown-IPC)  
W78-10678

**COMPACT EFFLUENT CLARIFICATION SYSTEM,**  
Canadian Forestry Service, Ottawa, Ontario K1A 0H3. Cooperative Pollution Abatement Research (CPAR) Project Report 399-1, Final Report to March 31, 1976. 12 p, 3 fig.

Descriptors: \*Pulp wastes, \*Waste water treatment, \*Wood wastes, Suspended solids, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Filtration, Filters, Sand, Aeration, Biological treatment, Separation techniques, Chemical precipitation, Oxidation, Woodroom effluents, Barking (Of wood), Effluents.

Two wire-wound filters for purification of barking effluents did not permit reproducible measurements to be made of filtration parameters. Although a combination of wire-wound and sand filters achieved temporary clarification of woodroom effluent, the continuous precipitation of solids due to oxidation made it impossible to evaluate the system. It is recommended that barking wastes be thoroughly oxidized (by extended aeration or biological treatment) prior to final removal of particulate solids. (Brown-IPC)  
W78-10679

**STUDY OF THE FEASIBILITY OF TREATMENT OF STRAW PAPER MILL EFFLUENTS (STUDIO DI FATTIBILITÀ SUI TRATTAMENTI DI EFFLUENTI DI CARTIERE A PAGLIA),**  
G. Nardini, L. Petarca, and M. Baudone. *Cellulosa e Carta*, Vol 28, No 10, p 3-11, October, 1977. 6 fig, 16 ref, 5 tab. English Summary.

Descriptors: \*Pulp wastes, \*Waste water treatment, \*Flocculation, Dissolved solids, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Lime, Biological treatment, Laboratory tests, Activated sludge, Water reuse, Recycling, Pulp and paper industry, Phosphoric acid, Straw paper.

Experiments are reported concerning treatments for effluents from the pulping of straw with lime. Improvement in effluent quality, to a level permitting reuse in the manufacturing process, was achieved by flocculation of waste water solids with phosphoric acid. Laboratory biological treatment tests yielded the parameters necessary for dimensioning an activated sludge reactor. (Speckhard-IPC)  
W78-10681

**REGENERATION OF ACTIVATED SLUDGE IN BIOLOGICAL PURIFICATION OF EFFLUENTS FROM FERMENTATION PLANTS (IZUCHENIE REGENERATSII AKTIVNOGO ILA V**

**USLOVIKH BIOLOGICHESKOI OCHISTKI STOKOV GIDROLIZNYKH ZAVODOV),**  
Vsesoyuznyi Nauchno-Issledovatel'skii Inst. Gidroliznoi Promyshlennosti Moscow (USSR). T. V. Zharova, and T. G. Chernyatinskaya. *Gidroliznaya i Lesokhimicheskaya Promyshlennost'*, No. 8, p 5-7, 1977. 2 fig, 4 ref.

Descriptors: \*Activated sludge, \*Sludge regeneration, Chemical industry, Wastes, Waste treatment, Water pollution sources, Industrial wastes, Respiration, Aeration, Costs, Sludge, Biological treatment.

The biological purification process in aeration tanks includes a compulsory regeneration of activated sludge by air blowing. Different opinions concerning the effects of regeneration are discussed. To further study this problem, laboratory experiments were conducted in which the effects of active sludge regeneration on its respiration rate and the rate and extent of substrate utilization were investigated. The sludge used was obtained from aeration tanks in which extensive and partial purification had been conducted. Non-regenerated sludge from both types of tanks served as control. Aeration tended to decrease the respiration rate as well as the utilization of organic substrate. Thus, there is no justification for sludge regeneration, considering the additional cost of this process. (Stapinski-IPC)  
W78-10683

**IMPROVING METHODS FOR ELIMINATING INJURIOUS WASTES FROM WOOD-PROCESSING PLANTS (VERVOLLKOMMUNG DER VERFAHREN ZUR BESEITIGUNG SCHÄDLICHER EMISSIONEN HOLZVERARBEITENDER BETRIEBE),**  
V. Biryukov, N. Paskov, M. Zamaraev, and V. Sokolov. *Holztechnologie*, Vol 18, No 4, p 235-238, December, 1977. 2 tab. English summary.

Descriptors: \*Waste water treatment, \*Fiberboard mills, Conferences, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Europe, Water consumption (Except consumptive use), Effluents, Air pollution, Dusts, Filters, Water utilization, Sludge, Pollution abatement, Forest products industry.

This article summarizes the proceedings of a symposium of Comecon countries dealing with possibilities for improving processes and methods for cleaning liquid effluents and gaseous emissions from wood-processing plants. Bulgaria, Hungary, East Germany, Poland, Romania, Czechoslovakia, and the Soviet Union are compared as to their use of water per ton of wet-process fiberboard and as to the composition of the effluent. The wet-process fiberboard industry is discussed separately, including the water cycle, the reduction of wood hydrolysis wastes, effluent purification, and sludge utilization. The other wood-based industries use much less water, but gaseous emissions are more of a problem. The precipitation of solid particle dusts by cyclones, filters and wet processes, and the removal of undesirable volatile constituents are discussed. (Ward-IPC)  
W78-10684

**ELECTROCHEMICAL DECOLORIZATION OF KRAFT MILL EFFLUENTS,**  
British Columbia Research Council, Vancouver. K. Oehr. *Journal Water Pollution Control Federation*, Vol 50, No 2, p 286-289, February, 1978. 6 fig, 1 illus, 9 ref.

Descriptors: \*Bleaching wastes, \*Pulp wastes, \*Waste water treatment, \*Electrolysis, \*Color, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution

sources, Anodes, Electric power, Pulp and paper industry, Organic compounds, Electrochemistry, Water purification.

Test solutions which contain mixtures of total kraft mill or caustic extraction effluent and sea water were recycled through Pepcon (Pacific Engineering and Production Co., Nevada) annular flow electrolytic cells. The removal of colored organic compounds was thought to occur by hypochlorite oxidation. The hypochlorite, along with chlorate and chlorine, were produced electrochemically from chloride ion. The decolorization efficiency increased as the anode current density decreased and as the free chloride content of the effluent was increased. Lead dioxide was preferable to graphite as an anode material. Temperature changes had no significant effect on decolorization efficiency. For a 1:1 caustic extraction or total kraft mill effluent and sea water mixture, the power requirement is about 10 kw-hr/1000 gal at about 80% color removal and 5.4 milliamperes/sq cm. (Swichtenberg-IPC)  
W78-10685

**DEVELOPMENT OF COLOR REMOVAL POTENTIAL IN ORGANISMS TREATING PULP AND PAPER WASTEWATER,**  
Biochemical Corp. of America, Salem, VA. L. Davis, J. E. Blair, and C. W. Randall. *Journal Water Pollution Control Federation*, Vol 50, No 2, p 382-386, February, 1978. 3 fig, 3 ref, 4 tab.

Descriptors: \*Bleaching wastes, \*Waste water treatment, \*Biological treatment, \*Color, Bacteria, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Pulp wastes, Hydrogen ion concentration, Nutrients, Phosphorus compounds, Nitrogen compounds, Biodegradation, Microorganisms, Enzymes, Adsorption.

A series of experimental procedures, developed jointly by the Biochemical Corporation of America (Salem, Virginia) and the Virginia Polytechnic Institute and State University (Blacksburg), are designed to select, isolate, and possibly alter specific bacteria for degradation of color bodies in kraft bleach plant (CEDED) effluents. The effects of pH, organic nutrients (viz., P and N), additional salts, sterilization of effluent, and acclimation of inoculum are investigated. The results show that adsorption and enzymatic degradation play major roles in biological decolorization of kraft mill effluents. While color-destroying organisms can be selectively grown in a controlled environment, it remains to be seen whether these somewhat specialized organisms can succeed in populating lagoons and other biological treatment systems in competition with organisms already adapted to the chemical and climatic environment. (Swichtenberg-IPC)  
W78-10686

**WATER RECOVERY AND EFFLUENT TREATMENT FOR THE PAPER INDUSTRY,**  
R. J. Kiff. *Paper*, Vol 189, No 2, p 67-68, 70, January 23, 1978. 3 illus, 1 tab.

Descriptors: \*Pulp and paper industry, \*Waste water treatment, \*United Kingdom, Wastes, Industrial wastes, Pulp wastes, Sulfite liquors, Water pollution treatment, Water pollution sources, Biochemical oxygen demand, Chemical oxygen demand, Suspended solids, Hydrogen ion concentration, Flotation, Biological treatment, Sedimentation.

Effluent assessment and treatability studies, the nature of effluents, and British treatment systems are discussed. Effluents from debarking, wood washing, groundwood production, and kraft, soda, sulfite, semichemical, and nonwood raw material

### Group 5D—Waste Treatment Processes

**PYROLYSIS OF INDUSTRIAL WASTES,**  
Greeley and Hansen, Chicago, IL.  
For primary bibliographic entry see Field 5E.  
W78-10689

Barking effluents from the Swiecie pulp and paper mill (Poland) were coagulated with aluminum sulfate. The freshly decanted sediments were treated with 0.1 molar NaOH, 0.022 molar calcium hydroxide, and 3, 0.6, and 0.15 molar sulfuric acid.

**FILTER BED FLOOR TILES.**  
For primary bibliographic entry see Field 8F.  
W78-10696

A method is provided for recovering adsorbable chemicals from dilute process streams, particularly for concentrating and recovering chemicals from waste condensates derived in kraft or sulfite pulping. For example, the process can be used to recover furfural, sulfur dioxide, and acetic acid from a stream of sulfite pulping waste condensate comprising condensed digester relief and blow gases and condensates from the evaporation of the spent sulfite liquor. The process involves concentrating the chemicals from the dilute waste stream by adsorption on an activated carbon column, then desorbing with an agent such as methanol to form a partially concentrated feed stream containing a higher concentration of the chemicals than the original stream, and subjecting the partially concentrated stream to fractional distillation to yield the desired chemicals in concentrated form (e.g., 90% by weight or better). By using two carbon columns alternately operated in adsorption and regeneration (desorption) modes, and by suitable recycling and holding steps, and by using a single fractionator to accomplish both intermediate and final concentration, it is possible to operate the system continuously using equipment normally used for batch operations. In addition to this saving in equipment cost, the steam consumption is relatively low, thus realizing further reductions in the overall cost of the system. (Lynch-IPC) W78-10698

An improvement including high-level contaminants, inert solid contaminants, closed. The water from refineries, water from water from combined modification treatment, fluent water includes conducted or four



**CLOSED PROCESS WATER LOOP IN NSSC CORRUGATING MEDIUM MANUFACTURE**, Green Bay Packaging Inc., WI.  
G. O. Walraven, W. R. Nelson, P. E. DeRossi, and R. L. Wisneski.

U.S. Environmental Protection Agency, Environmental Protection Technology Series EPA-600/2-77-241, 94 p, December, 1977. 3 appendices, 22 fig, 4 illus, 3 ref, 1 tab. S-800520.

**Descriptors:** \*Water conservation, \*Pulp and paper industry, \*Pulp wastes, \*Recycling, \*Corrugating medium mills, Water pollution sources, Wastes, Industrial wastes, Reverse osmosis, Membrane processes, Wisconsin, Operation and maintenance, Economics, Biochemical oxygen demand, Water pollution control, Spills, Closed systems, Sulfite pulp mills.

Over the past 5 years, the corrugating medium mill of Green Bay Packaging Inc. in Green Bay, Wisconsin, has been converted to an essentially closed process water system. The mill is a net consumer of water. This is due to the greater amount of water carried out of the system with the sheet compared to the lower water content entering the process system in raw materials. Many small dilute water streams are accepted into the process without upsetting the water balance. When extraneous water inputs do upset the system balance, the condition is correctable by removing water either by thermal evaporation or reverse osmosis. The reverse osmosis plant operating performance and economics are described. Although many reverse osmosis operating problems have been solved, flux rates are somewhat lower than had been predicted. Other system additions and revisions for process water entrapment, recycle, and surge protection are described. A monitoring system is in use for early spill detection and problem correction. Levels of BOD loss have been reduced from the 9,072 kg/day (20,000 lb/day) range of 1971 to less than 454 kg/day (1,000 lb/day) as a monthly average for 1975. The daily maximum of 1,814 kg (4,000 lb) has not been exceeded in any mill-operating day during 1975. (Witt-IPC)  
W78-10699

**EFFECTS OF CLARIFICATION PROCEDURES ON EFFLUENT DISCHARGE FEES** (AUSWIRKUNGEN VON KLAERMASNAHMEN AUF DIE HOEHE DER ABWASSERABGABE),  
For primary bibliographic entry see Field 5G.  
W78-10700

**PROCESS FOR THE PURIFICATION OF WASTE WATER**, Standard Oil Co., Chicago, IL. (Assignee).  
J. F. Grutsch, R. C. Mallatt, and B. F. Steely.  
U.S. Patent No. 4,073,722, 11 p, 1 fig, 2 tab, 12 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 610, February 14, 1978.

**Descriptors:** \*Patents, \*Waste water treatment, \*Water purification, \*Water pollution treatment, Industrial wastes, Oil wastes, Filtration, Activated sludge, Oxygenation, Tertiary treatment.

An improved process for treating waste water including high and variable concentrations of BOD5 contaminants, COD contaminants, oil and grease, inert solids, ammonia, phenolics, and other contaminants which are relatively refractory is disclosed. The process is adapted to treat waste water from municipalities and also waste water from oil refineries and chemical complexes where the water from the refining of oil is mixed with waste water from chemical plants and waste water from combined municipal/industrial sources. The modifications in the intermediate and secondary treatments result in substantial improvement in effluent water quality. The intermediate treatment includes equalization and filtration. Equalization is conducted in a basin having two, preferably three or four compartments. These compartments are

mixed and arranged in series so that water flows from one compartment to the next succeeding compartment. Aeration thoroughly agitates and mixes the water with the result colloidal and suspended oils and solids are mechanically flocculated and accumulate on the water surface. These oily solids are removed by skimming. Water from intermediate treatment flows through a conventional activated sludge plant which has been modified in two important ways: the sludge-water mix flowing between stages of activated sludge process is aerated, and the sludge of different ages from different stages is recycled to one or more upstream stages. Dissolved oxygen maintains the sludge in the clarifier tank aerobic and ensures that the effluent water to the subsequent tertiary treatment includes at least three parts of dissolved oxygen per million parts of water. (Sinha-OEIS)  
W78-10709

**REMOVAL OF TRINITROTOLUENE FROM AQUEOUS MEDIA**, Polytechnic Inst. of New York, Brooklyn, NY. (Assignee).  
Y. Okamoto, J. Y. Want, and E. J. Chou.  
U.S. Patent No. 4,073,726, 4 p, 2 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 611, February 14, 1978.

**Descriptors:** \*Patents, \*Waste water treatment, \*Water pollution treatment, Industrial wastes, Chemical wastes, Separation techniques, Organic compounds, Chemical precipitation, Munitions and Explosives industry, \*Trinitrotoluene (TNT).

A simple, safe and low cost method of removing TNT from waste water is provided. The method is based on the discovery that certain amino group containing compounds alone or together with cationic compounds cause the formation of water-insoluble reaction products with TNT. The resulting precipitates can be readily and safely removed and the treated waste water can then be safely discharged or further treated to remove other pollutants, without hazard, by conventional methods. (Sinha-OEIS)  
W78-10710

**PROCESS FOR THE OXIDATION OF WASTE LIQUORS ARISING FROM THE MANUFACTURE OF PAPER PULP**, Groupement European Dela Cellulose, Paris (France). (Assignee).  
Y. G. Garrigues.  
U.S. Patent No. 4,073,727, 5 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 612, February 14, 1978.

**Descriptors:** \*Patents, \*Waste water treatment, \*Water pollution treatment, Industrial wastes, Pulp and paper industry, Oxidation, Equipment, Bubbles.

An oxidation process is described which is applicable to waste liquors (black liquors and white liquors) arising from the manufacture of paper pulp. The aqueous liquor containing caustic soda and sodium sulphide are oxidized in a reservoir containing candles of a sintered material placed horizontally. Air for oxidation is introduced into the candles at about 90 deg C and oxidation is carried out at a temperature of from 70 deg to 90 deg C. The candles are made of sintered stainless steel with 3 to 5 micron pores. The air blown through these candles form very fine air bubbles of large specific surface area. (Sinha-OEIS)  
W78-10711

**ULTRAFILTRATION WATER COLLECTOR**, Systems Engineering and Corp., Stoughton, MA. (Assignee).  
For primary bibliographic entry see Field 5F.  
W78-10712

**SODIUM HYPOCHLORITE TREATMENT FOR REMOVAL OF CYANURATE COMPOUNDS FROM AQUEOUS WASTE STREAMS**, FMC Corp., Philadelphia, PA. (Assignee).  
R. H. Carlson.

U.S. Patent No. 4,075,094, 8 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 967, No 3, p 1064, February 21, 1978.

**Descriptors:** \*Patents, \*Waste water treatment, \*Water pollution treatment, \*Industrial wastes, Chemical reactions, Chlorine, Oxidation, \*Sodium hypochlorite.

The manufacture of sodium dichloroisocyanurate and trichloroisocyanuric acid is accompanied by the production of aqueous waste streams containing dissolved cyanurates, the pollution-free disposal of which presents a special problem. This invention provides a means for reducing the levels of cyanurate compounds present in the chlorinator waste stream to less than 15 ppm by reaction of the waste stream with sodium hypochlorite in either a batch or continuous process, and has particular application to the treatment of such waste streams that have been dechlorinated with hydrogen peroxide to reduce soluble cyanuric acid levels from 2% to 200-3,000 ppm. Further oxidation of such waste streams, containing as much as 3,000 ppm of cyanurate compounds with sodium hypochlorite can result in an effluent that meets zero nitrogen discharge requirements. The reaction rate is related to such variables as pH, temperature, initial concentration of cyanurate compounds and initial sodium hypochlorite concentration. Excess sodium hypochlorite can be subsequently destroyed by reaction with hydrogen peroxide. (Sinha-OEIS)  
W78-10718

**DRAINAGE AND SEWAGE PUMPS.**  
For primary bibliographic entry see Field 8C.  
W78-10719

**METHOD FOR TREATMENT OF DIGESTER SUPERNATANT AND OTHER STREAMS IN WASTEWATER TREATMENT FACILITIES**, M. D. Richard.  
U.S. Patent No. 4,076,515, 8 p, 3 fig, 19 ref; Official Gazette of the United States Patent Office, Vol 967, No 4, p 1541, February 28, 1978.

**Descriptors:** \*Patents, \*Waste water treatment, \*Sewage treatment, \*Water pollution treatment, Sludge treatment, Nitrogen, Ammonia, Separation techniques, Fertilizers.

Digester supernatants and/or liquors from sludge dewatering are reacted with an excess of an alkaline reagent having a stronger cation than the ammonium ion and the reaction product is separated into a solution containing aqueous ammonia and solids. The aqueous ammonia derived from the separation stage is heated by free steam under a lowered pressure to free ammonia in gaseous form. The ammonia as a gas, or adsorbed in water, or adsorbed in an acid, or as an acid salt is then mixed with conventionally dried sludge to increase the nitrogen content of the sludge from approximately 1-2 percent to as high as 10 percent.  
W78-10721

**SUB-SERVICE SURVEYING.**  
For primary bibliographic entry see Field 7B.  
W78-10723

**MULTI-PART EXAMPLE OF SOLIDS/VOLATILES RELATIONSHIPS**, D. A. Lee.  
Water and Sewage Works, Vol. 125, Reference Number, p 188, April, 1978. 1 tab.

**Descriptors:** \*Mathematical models, \*Analytical techniques, \*Sludge treatment, \*Dewatering,

### Group 5D—Waste Treatment Processes

Mathematical models described the relationship between solids recovery and water removal in waste activated thickening, filtering, and drying processes. The models were used in estimating appropriate sizes for process equipment and feed rates and calculating associated cost factors. Equations were developed which interrelated volatile removal on the filter press, solid sludge discharge, feed rate, and associated parameters of food solids content and moisture content in the final sludge product. The solids/volatiles analysis was applied to a thickener with a feed rate of 20 tons/hr and a sludge solids content of 7.8% prior to pressure filtration dewatering and drying. After filtration, the sludge solids content was 68.8%; a final 1.5% moisture content after drying was desired to make the sludge suitable as a fertilizer. Results from these calculations were used to approximate the fuel requirements associated with sludge drying. (Lisk-FIRL)

W78-10724

exchange medium. The extracted complexed heavy metals and complexing agents are removed from the exchange medium and returned to the electroless metal deposition operation. This results in a continuously operating electroless metal deposition operation. This results in a continuously operating electroless metal deposition bath from which by-products of the deposition process are removed, and from which heavy metals and complexing agents are not discharged as pollutants. Optionally, in batch-wise metal deposition operations, the extracted heavy metal and complexing agent can be recovered from the exchange medium and, instead of being returned directly to metal deposition, prepared as a concentrate for future use in other metalizing operations. In another embodiment, solutions of alkanolamine complexing agents and alkanolamine-complexed heavy metals, e.g. metal cleaning solutions, electroplating baths, etchant solutions, and the like, are treated by the same pH-adjustment and contact with an ion exchange medium to remove the complexed heavy metal and complexing agents from solution, thus preventing their discharge as pollutants and enabling reuse of these materials if desired. (Sinha-OEIS)

Hydrogen sulfide is generated under anaerobic process conditions in many industrial processes. Although this invention is used typically on waste water from refinery operation it is useful in the treatment of any sour water stream. A process is described for effecting combined stripping of hydrogen sulfide gas from sour water and conversion of both the evolved hydrogen sulfide and also the residual dissolved hydrogen sulfide to sulfur. An aqueous chelated iron solution is utilized as a catalyst or reagent to effect conversion of the hydrogen sulfide to sulfur. Contacting of the hydrogen sulfide-containing gas stream with the chelated iron solution (in which the iron is in the ferric state) effects oxidation of the hydrogen sulfide to elemental sulfur with concomitant reduction of the iron from the ferric state to the ferrous state. The solution is regenerated by aeration or the like to oxidize the iron to the ferric state. (Sinha-OEIS)  
W78-10729

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**CHLORIDE, ISOPROPANOL AND POLYVALENT METAL IONS.**

Soviet Patent SU-563-423. Issued October 20, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 21, p. 5, July, 1978.

Descriptors: \*Flocculation, \*Activated sludge, \*Polymers, \*Patents, \*Chemical precipitation, Centrifugation, Separation techniques, Magnesium, Calcium, Sodium chloride, Waste water treatment, Municipal wastes.

A method to prepare a water insoluble biopolymer flocculant from activated sludge has been patented. The activated sludge is initially centrifuged and extracted with a 2% disodium ethylenediaminetetraacetic acid solution for 4-5 hrs at 0-4°C. The extracted residue is centrifuged for 20 min at 0-4°C and treated with 2% NaCl in a volume of propanol or isopropanol equal to the sludge volume. The resulting biopolymer precipitate is redissolved in water and mixed with a magnesium or calcium ion-bearing aqueous solution. Polyvalent metal ions are added in the range of 0.05-0.125 mg/eq per mg of precipitate at 4-20°C to yield a 30% biopolymer flocculant. The flocculating agent can accelerate clarification rates by a factor of 2-8. (Lisk-FIRL) W78-10772

**EFFLUENT PURIFICATION - BY CONTROLLING MICROBIAL CONCENTRATION AND FLOW IN THE AERATION TANK.**

French Patent FR 2362-794. Issued April 28, 1978. Derwent French Patents Abstracts, Vol. A, No. 21, p. 4, July, 1978.

Descriptors: \*Microbial degradation, \*Biological treatment, \*Nutrient removal, \*Patents, \*Biomass, Carbon, Nitrogen, Phosphorus, Biochemical oxygen demand, Aeration basins, Waste water treatment, Municipal wastes.

Aeration basin retention time may be reduced and nutrient removal improved when a 3-25 ratio of total organic carbon treated/day to microbial concentration based on weight is maintained in the aeration basin. The weight of the microbial concentration comprises 20-200 percent of the total organic content of the aeration tank effluent. This patented technique eliminates removal of activated sludge for recycle and prevents microbial inactivation under anaerobic conditions. The reduced microbial population of 50-400 ppm reduces the effluent residence time in the aeration tank to 1.5-6.0 hrs. The proliferation of active microorganisms improves nutrient removal; nitrogen is reduced by 70-90%, phosphorus by 50-70%, and BOD by 90-96%. (Lisk-FIRL) W78-10789

**SLUDGE DREDGER - FOR ELONGATED SETTLING TANKS ETC.**

German Patent DS 2203-865. Issued May 24, 1978. Derwent German Patents Abstracts, Vol. A, No. 22, p. 2, July, 1978.

Descriptors: \*Settling basins, \*Sludge treatment, \*Patents, \*Hydraulic equipment, \*Dredging, Design data, Bridges, Traction, Sludge disposal, Sewage sludge, Equipment, Sanitary engineering, Waste water treatment, Municipal wastes.

A patent has been issued for a sludge scraping apparatus to be used with elongated clarifiers. A sludge scraper bridge is equipped with the scraper blade, a loading device, and a blade lifting unit. The scraper blade pivots up and down within the tank. The loading device is vertically mobile and is equipped with a connection rod assembly containing the blade lifter. The lifter, provided with a traction and pressure drive system, removes the blade from the clarifier. The loading device, which becomes operational after the sludge blade is lifted from the tank, has a release force that counteracts the load force. The release force is activated by a

spring or weight assembly which supplies slightly less force than that of the loading system. The lifter size required for removing the scraper blade determines the size of the sludge scraping apparatus. (Lisk-FIRL) W78-10804

**CENTRIFUGAL LIQUID/SLUDGE SEPARATOR - WITH AXIALLY ACTUATED VALVE FOR SUPPLEMENTARY OUTLETS.**

Soviet Patent SU-566-509. Issued August 19, 1977. Derwent Soviet Inventions Illustrated, Vol. A, No. 23, p. 8, July, 1978. 1 fig.

Descriptors: \*Centrifugation, \*Separation techniques, \*Sewage sludge, \*Channels, \*Pistons, Patents, Design data, Equipment, Outlets, Rotors, Waste water treatment, Municipal wastes.

A patent has been issued for a centrifugal waste water/sewage sludge separator which automatically evacuates accumulated sludge without interrupting operation. The centrifuge is equipped with a rotor containing a piston; located along the walls of the rotor and piston are channels which operate as jets and rim outlets. Waste water is conveyed along the hollow rotor shaft to a separator having insert vanes. As the waste water is passed into the separator, sludge is drawn through the channels along the rotor and piston. Sludge accumulates on a deposit pad located beneath the separator inserts. When sufficient sludge accumulates to reach the inserts, the piston is automatically activated. The piston descends, forcing the sludge from the deposit pad through an outlet. (Lisk-FIRL) W78-10805

**PURIFYING WASTE WATER OF HIGH ORGANIC CONTENT - FIRST ACID ANAEROBIC, THEN AEROBIC, THEN ANAEROBIC METHANE FERMENTATIONS.**

French Patent FR 2364-184. Issued May 12, 1978. Derwent French Patents Abstracts, Vol. A, No. 23, p. 4, July, 1978.

Descriptors: \*Anaerobic digestion, \*Aerobic conditions, \*Organic wastes, \*Patents, \*Methane bacteria, Acid bacteria, Methane, Carbon dioxide, Biological treatment, Digestion, Inhibition, Neutralization, Waste water treatment, Municipal wastes.

A patented process reduces the organic content of waste water with combined anaerobic and aerobic digestion. The highly organic waste water is anaerobically digested in an acid medium which supports a microbial culture to convert contained oxygen to an organic acid mixture; fermentation occurs at a temperature of 20-50°C over a residence time of 0.1-0.8 days/kg/cu m. The acidity of the waste water during anaerobic digestion inhibits methane fermentation. The waste water is then treated by aerobic fermentation for a residence period of 0.2-0.3 days/kg/cu m, followed by anaerobic methane digestion for 6-15 days. Neutralization with an alkali is not required because acid is converted to CO<sub>2</sub> and H<sub>2</sub>O by the process. The treated effluent may be further aerobically digested after the anaerobic methane digestion stage. (Lisk-FIRL) W78-10808

**FOOD PROCESSING PLANT WASTE WATER PURIFICATION - BY ELECTRO-FLotation. USING TITANIUM ALLOY ELECTRODES FOLLOWED BY ELECTRO-COAGULATION STEP.**

Soviet Patent SU-562-515. Issued August 9, 1977. Derwent Soviet Inventions Illustrated Vol. A, No. 21, p. 2, July, 1978.

Descriptors: \*Electrolysis, \*Flotation, \*Coagulation, \*Titanium, \*Patents, Electrodes, Food processing industry, Oily water, Steel, Foaming, Waste water treatment, Industrial wastes.

A patent has been issued for an electro-flotation and electro-coagulation process to remove oils, insoluble materials, soluble organics, and minerals from food processing wastes. The waste water is electro-flotated for 15 min between titanium alloy electrodes; the electrodes are 10 mm apart and operated at current densities of 10 milliamperes/sq cm. Surface foam is periodically skimmed during flotation. The waste water is then electro-coagulated for 10 min with No. 3 steel electrodes, spaced 40 mm apart; the anode current density is 25 milliamperes/sq cm. The surface foam-bearing electrolysis particles are then skimmed and discarded. Following electro-coagulation, the waste water is retreated by electro-flotation. When the process was applied to fish processing effluent, insoluble materials were reduced from 20 to 0.3 g/liter, oxidizable biochrome from 20 to 0.06 g/liter, and total fats from 12.0 to 0.02 g/liter; transparency was improved from 3.5 cm to 47 cm. (Lisk-FIRL) W78-10820

**LOW PH WASTE WATER FERROUS ION OXIDATION - USING IRON OXIDIZING BACTERIA ON ANTIACID POROUS GRANULES WITH AIR AGITATION, SETTLING, RECYCLING.**

French Patent FR 2362-793. Issued April 28, 1978. Derwent French Patents Abstracts, Vol. A, No. 21, p. 4, July, 1978.

Descriptors: \*Oxidation, \*Iron, \*Mine water, \*Mine wastes, \*Patents, Acid mine water, Iron bacteria, Iron oxides, Chemical precipitation, Settling basins, Granules, Separation techniques, Waste water treatment, Industrial wastes.

A patent has been issued for a ferrous iron oxidation process which employs iron-utilizing bacteria suitable for treating acid mine effluents. An oxidation zone contains the acid resistant iron-utilizing bacteria supported on antacid porous granules. The ferrous iron in the waste water is oxidized within the aerobic zone and the resulting iron-bearing gas is utilized as an energy source. The waste water is transferred from the oxidation zone to a settling zone where the oxidized iron is precipitated from the solution. The granules supporting the bacteria are separated from the waste water and recycled to the oxidation zone. (Lisk-FIRL) W78-10821

**LIQUID WASTE TREATMENT APPARATUS.**

United States Patent 4,082,662. Issued April 4, 1978. Official Gazette of the United States Patent Office, Vol. 969, No. 1, p. 269, April, 1978.

Descriptors: \*Organic wastes, \*Aeration, \*Patents, \*Design criteria, \*Equipment, Aerated lagoons, Shear, Shear strength, Shear stress, Pressure head, Waste water treatment, Municipal wastes.

A patent has been issued for a waste water pretreatment process employing aeration. The waste water is pumped horizontally through a nozzle with a reduced diameter into an aeration tank which has an equilateral, elongated cross section. The organic solids in the waste water are broken up by the shearing action of the influent as entrained gas is released. Air is aspirated into the aeration chamber through the area around the influent nozzle and mixed with the liquid waste by the turbulent action in the aeration chamber. Further mixing of the air and waste water to release the entrained air and breakdown the organic solids is accomplished by passing the wastes into a mixing chamber with a large cross section maintained by ambient pressure. (Lisk-FIRL) W78-10822

**CENTRIFUGE FOR DRAINING OFF SEWAGE SLUDGE, J. Steen.**



### Group 5D—Waste Treatment Processes

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R. A. Conway, C. T. Lawson, and M. J. Stankewich, Jr.  
United States Patent 4,080,287. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol 968, No 3, p 1092, March, 1978. 1 fig.

Descriptors: \*Activated carbon, \*Activated sludge, \*Oxygenation, \*Patents, Absorption, Biological treatment, Oxidation, Design data, Oxygen, Organic wastes, Biodegradation, Waste water treatment, Municipal wastes.

A patent has been issued for a waste water oxygenation process utilizing activated sludge and carbon. Effluent bearing biodegradable organics is introduced into an enclosed oxygenation zone and mixed with activated sludge and a feed gas containing 50% oxygen. Carbonaceous materials are biochemically oxidized, reducing the BOD of the oxygenated supernatant. Vent gas, containing 20-70% oxygen, is withdrawn from the tank; the oxygenated liquor is separated from the activated sludge and residual contaminants. A portion of the activated sludge is returned to the oxygenation zone; the effluent is passed upward through an activated carbon absorption zone where the depleted vent gas is added to provide a dissolved oxygen level of 2 ppm to maintain aerobic biological conditions within the activated carbon column. Residual organic contaminants in the effluent are absorbed or biologically oxidized within the activated carbon absorption zone. (Lisk-FIRL)  
W78-10981

**CENTRIFUGAL SEWAGE PUMP,**  
Kabushiki Kaisha Sogo Pump Seisakusho, (Osaka) Japan. (Assignee)  
For primary bibliographic entry see Field 8C.  
W78-10989

**METHOD OF TRANSFORMING SLUDGE INTO ECOLOGICALLY ACCEPTABLE SOLID MATERIAL,**  
F. Manchak.  
United States Patent 4,079,003. Issued March 14, 1978. Official Gazette of the United States Patent Office, Vol 968, No 2, p 654, March, 1978.

Descriptors: \*Sludge treatment, \*Patents, \*Sewage bacteria, \*Viruses, \*Disinfection, Alkalinity, Chemical reactions, Thermal properties, Heat, Solubility, Waste water treatment, Design data, Municipal wastes.

A patent has been issued for a process to convert liquid sludge which contains bacteria, viruses, and toxic soluble compounds into a solid, friable, odorless material. The sludge is introduced into one end of an elongated tank at a specific rate; calcium oxide is introduced at another rate. The sludge reacts with the calcium oxide in an exothermic manner as the materials move toward one end of the tank. The exothermic reaction generates steam and forms a solid, friable, odorless sludge cake with a pH of 12. The alkaline conditions and the heat produced by the reaction inactivate the bacterial and viral organisms and transform the water soluble compounds into insoluble form. The steam is removed from the tank and the solids reaction product is withdrawn from the end of the tank. (Lisk-FIRL)  
W78-10991

**COMPOSITION AND METHOD FOR DISPERSING FLOCCULANT POLYMERS,**  
Chemed Corp., Cincinnati, OH. (Assignee)  
B. C. Chambers.  
United States Patent 4,089,831. Issued May 16, 1978. Official Gazette of the United States Patent Office, Vol 970, No 3, p 1039, May, 1978.

Descriptors: \*Polymers, \*Flocculation, \*Dispersion, \*Patents, \*Separation techniques, Aqueous solutions, Coagulation, Design data, Solubility, Waste water treatment, Municipal wastes.

A process for dispersing high molecular weight flocculant polymers or copolymers to prevent agglomeration in waste water has been patented. The flocculant polymers or copolymers are mixed with a free flowing powdered inert material and water. The inert substance is added as 10-80% of the weight of the flocculant polymer; water is added to 0.10-20% of the weight. When the polymer solution, containing the inert powder, is introduced into water, the solubility of the flocculant is decreased. As the solution rate slows, the solids disperse and separate. Dispersion of the solids particles in the flocculant polymers prevents the agglomeration of the polymers or copolymers. (Lisk-FIRL)  
W78-10992

**METHOD FOR TREATING SEWAGE,**  
J. L. Ramer.  
United States Patent 4,089,761. Issued May 16, 1978. Official Gazette of the United States Patent Office, Vol 970, No 3, p 1022, May, 1978. 1 fig.

Descriptors: \*Biological treatment, \*Electrolysis, \*Aerobic bacteria, \*Patents, \*Oxygen, Hydrogen, Digestion, Sewage bacteria, Nutrient removal, Design data, Equipment, Ventilation, Waste water treatment, Municipal wastes.

A patent has been issued for a biological waste water treatment process in which oxygen and hydrogen are generated by electrolysis. Influent raw sewage is comminuted to an aqueous slurry and introduced into a digester containing aerobic bacteria. Oxygen for degradation of the sewage slurry by the aerobic bacteria is generated by electrolysis which simultaneously generates hydrogen. The digester is enclosed to prevent the escape of oxygen; hydrogen is maintained separate from the oxygen in the digester. The bacteria are sustained in the presence of oxygen while the hydrogen is vented from the waste water treatment unit. (Lisk-FIRL)  
W78-10994

**PROCESS FOR DEWATERING ORGANIC WASTE PRODUCT,**  
Organics, Inc., Slatersville, RI. (Assignee).  
J. M. O'Donnell.  
United States Patent 4,081,366. Issued March 28, 1978. Official Gazette of the United States Patent Office, Vol 968, No 4, p 1456, March, 1978.

Descriptors: \*Sludge treatment, \*Dewatering, \*Ureas, \*Patents, \*Solubility, Organic compounds, Activated sludge, Organic wastes, Solid wastes design criteria, Waste water treatment, Municipal wastes, Filtration, Sewage sludge.

A dewatering process for treating sewage sludge in the presence of urea-formaldehyde has been patented. A urea-formaldehyde solution is reacted under alkaline pH to form water soluble, monomeric mono- and dimethylol ureas and excess urea. Waste activated sludge in an aqueous solution is reacted with the excess urea and water soluble, monomeric, methylol ureas at pH 7.0-9.0. An inorganic acid or acid salt is added to the mixture to lower the pH to 3.0-5.0 to condense the methylol ureas. The resulting water insoluble polyurea condensate has a molecular weight of < 800. The methylene bridged reaction product contains solid organic wastes and has linear, low molecular weight properties. An alkali is added to the solution neutralization and the solid fraction is filtered from the solution. (Lisk-FIRL).  
W78-10995

**ADSORBENT FOR THE TREATMENT OF WASTE WATER,**  
Japan Exlan Co. Ltd., Osaka. (Assignee).  
S. Takegami, T. Korenaga, and C. Yoshinaga.  
United States Patent 4,081,403. Issued March 28, 1978. Official Gazette of the United States Patent Office, Vol 968, No 4, p 1468, March, 1978.

Descriptors: \*Adsorption, \*Activated sludge, \*Patents, \*Resins, \*Granules, Formulation, Design data, Heating, Organic compounds, Waste water treatment, Municipal wastes.

A granular adsorption medium containing activated sludge and a condensate of a formaldehyde resin or dialdehyde compound has been patented. The adsorbent is prepared with 100 dry weight parts activated sludge-treated organic wastes which are mixed with 5 weight parts of a water soluble condensate of either or both formaldehyde resin and dialdehyde compound. The dialdehyde compound is chosen from group containing glyoxal, malonidialdehyde, succindialdehyde, and phthalidialdehyde. The 100:5 ratio mixture is cured by heating at 60-200°C and granulated. The medium is to be used for waste water treatment. (Lisk-FIRL)  
W78-11019

**ACTIVATED SLUDGE SYSTEM WITH STAGGERED PARTITION BASIN,**  
Air Products and Chemicals, Inc., Allentown, PA. (Assignee).  
C. S. Block, M. S. Chen, O. J. Noichl, and S. Hong.  
United States Patent 4,081,368. Issued March 28, 1978. Official Gazette of the United States Patent Office, Vol 968, No 4, p 1456-1457, March, 1978.

Descriptors: \*Activated sludge, \*Aeration, \*Patents, \*Flow system, \*Oxygen demand, Aerated lagoons, Intakes, Outlets, Design data, Equipment, Waste water treatment, Municipal wastes.

An activated sludge tank with staggered partitions for moving mixed liquor through the aeration cycle in a serpentine manner has been patented. The staggered partitions project toward the center of the tanks' width and extend the entire depth of the waste water. Mixed liquor is introduced into the tank through an inlet and is aerated as it passes in a cross-sectional flowpath. The open flowpath is maintained adjacent to the liquid passes in a range of 30-80% of the tank's wetted cross section. Complete mixing of the liquid passes is prevented to maintain an unequal oxygen demand through the effluent. Backflow is maintained between and within the liquid passes; the mixing factor of each aerator is within the range of 20-450. (Lisk-FIRL)  
W78-11050

**METHODS FOR USE IN WATER PURIFICATION PARTICULARLY SEWAGE TREATMENTS,**  
Filters International Inc., Chicago, IL. (Assignee).  
E. B. White, and M. N. Sharma.  
United States Patent 4,081,365. Issued March 28, 1978. Official Gazette of the United States Patent Office, Vol 968, No 4, p 1455, March, 1978. 1 fig.

Descriptors: \*Flocculation, \*Oxidation, \*Biological treatment, \*Chemical precipitation, \*Patents, Zeta potential, Aeration, Filtration, Adsorption, Separation techniques, Organic wastes, Suspended solids, Sewage, Waste water treatment, Municipal wastes.

A continuous, automatic waste water treatment process providing cyclical biochemical oxidation and flocculation-agglomeration of organic solids has been patented. Effluent containing more than 25 mg/liter BOD and suspended solids is introduced into an aeration chamber where the wastes are biochemically oxidized during periods of maximum sewage accumulation. During cycles of minimum sewage accumulation, following maximum accumulation periods, a preaerated flocculant is introduced into the chamber before the termination of biochemical oxidation to produce an instantaneous floc-agglomeration reaction in the sewage. The pH is maintained at a level suitable to the floc-agglomeration process; the zeta potential is stabilized at -5 to +5 ZP. Effluent is removed

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5D—Waste Treatment Processes

from the chamber during minimum accumulation periods and retreated with preaerated flocculant for further agglomeration of suspended solids which are then filtered from the effluent. Dissolved organic solids are removed from the filtered effluent by adsorption. (Lisk-FIRL) W78-11056

**ANALYSIS OF THE CONTROL AND PERFORMANCE OF ALGAL-WASTEWATER STABILIZATION PONDS,**  
Purdue Univ., Lafayette, IN. School of Mechanical Engineering.  
F. P. Incropera.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 709. Price codes: A05 in paper copy, A01 in microfiche. Purdue University Water Resources Research Center, Technical Report No. 104. September 1978. 77 p, 36 fig, 59 ref. OWRT-A-42-IND(4).

Descriptors: \*Oxidation lagoons, \*Chorella, \*Photosynthesis, \*Heat exchangers, \*Solar radiation, \*Waste water treatment, Stabilization ponds, Sewage treatment, Heated water, Thermal power plants, Water cooling, Algae, Central U.S.

There has been considerable interest in recent years in controlling the thermal condition of shallow water bodies used to effect beneficial biological conversion processes. Waste heat from a power production process may be used as the energy source for this control, and specific applications include wastewater treatment and algal production. In this study mathematical models were developed to assess means of maintaining thermal control and assessing the impact on wastewater treatment and algal production. The thermal response and control of a shallow pond which uses waste heat in a closed cycle cooling system was considered. Calculations suggested a heat exchanger design involving a network of 30m long, 25mm OD pipes on 0.15m centers. The design provides a reasonable compromise between initial cost and performance and enables maintaining near-optimum pond temperatures throughout the year for climatic conditions typical of the midwest. Calculations based on a model of a completely mixed activated sludge wastewater treatment system revealed the benefits to be derived from operation at elevated temperatures. Effluent quality is improved for any increase in temperature from 10 to 30 deg. C. Calculations based on a model of algal growth at optimum temperatures predicted daily yields which are in agreement with maximum yields which have either been measured or inferred from field studies. W78-11065

**DISPOSAL AND UTILIZATION OF HYDRAULICALLY DREDGED LAKE SEDIMENTS IN LIMITED CONTAMINATION AREAS,**  
Massachusetts Univ., Amherst. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 5E. W78-11067

**BIOFILTER,**  
Enso-Gutzeit Osakeyhtio, Helsinki (Finland). (Assignee).  
J. Tapola, M. Sten, and O. Koistinen.  
United States Patent 4,086,167. Issued April 25, 1978. Official Gazette of the United States Patent Office, Vol 969, No 4, p 1433, April, 1978. 1 fig.

Descriptors: \*Biological treatment, \*Filtration, \*Porous media, \*Nutrient removal, \*Patents, \*Bark, \*Wood wastes, \*Gravels, \*Drainage, \*Application equipment, \*Spraying, \*Microorganisms, \*Plastics, \*Linings, \*Aeration, \*Waste water treatment, \*Biodegradation, \*Design data, \*Municipal wastes.

A biological filter design incorporating beds of porous media lain in a cupshaped pit in the ground

and a waste water spray distribution apparatus has been patented. The plastic fabric-lined pit is filled with a bottom layer of gas- and liquid-permeable gravel, followed by a bed of coniferous tree bark-ing wastes extending above the top perimeter of the pit in a mound. The bark layer contains microorganisms and articles such as plastic, pine cones, tree limb sections, and tubular paper roll cores for maintaining the permeability of the filter bed and preventing compaction. The heap is covered with a roof equipped with a vertically mounted, rotating spray pipe for distribution of the waste water in a horizontal plane over the heap. The spray pipe contains a number of nozzles, each equipped with a deflector plate, and a feed tube supplying the waste water. Mounted within the gravel layer at the bottom of the pit is a radially extending pipe system which blows oxygen-bearing gas upward through the bark layer for aeration of the down flowing waste water. Below the aeration system, underdrains are embedded in the gravel for the collection and discharge of treated effluent. The roof is equipped with valves for exhausting the gas from the system. (Lisk-FIRL) W78-11074

**WATER TREATMENT: CONTAMINANTS.**

Ground Water Age, Vol. 12, No. 12, p 45-47, August, 1978. 1 fig.

Descriptors: \*Water pollution treatment, \*Waste water treatment, \*Water pollution effects, \*Water pollution sources, \*Microorganisms, \*Chemicals, \*Filtration, \*Demineralization, \*Distillation, \*Chlorination, \*Coliforms, \*Well construction.

Various mineral and biological contaminants, their effects, sources, and treatment are described. Fluoride, nitrates, chlorides, sulfates, and carbon dioxide create problems such as mottled teeth, oxygen starvation in babies, bad taste, laxative effects, and corrosion. They can be removed by various filters and chemical treatment but the best solution is prevention in the form of proper well construction. The most serious potential water problem is biological contamination. The presence of certain pathogens such as bacteria, viruses, and cysts can cause serious or even fatal diseases. This type of contamination is due to location of wells near sources of pathogens, poor well construction, and construction of shallow wells. The best test for biological contaminants is the presence of coliform bacteria since it is found in animal or human feces and is easy to detect. This test should be performed at least once a year. A well should be chlorinated after it is drilled, and whenever there is a threat of contamination it should be chlorinated continually by means of a chemical feed pump. (Purdin-NWWA) W78-11079

**SLUDGE THICKENING APPARATUS,**

Envirotech Corp., Menlo Park, CA. (Assignee).  
E. M. Kelly.  
United States Patent 4,082,671. Issued April 4, 1978. Official Gazette of the United States Patent Office, Vol 969, No 1, p 272, April, 1978. 1 fig.

Descriptors: \*Sludge treatment, \*Dewatering, \*Patents, \*Sewage sludge, \*Design data, \*Equipment, \*Intakes, \*Outlets, \*Sludge disposal, \*Separation techniques, \*Waste water treatment, \*Municipal wastes.

A patent has been issued for an apparatus which thickens primary and secondary sewage sludge. An open top tank is equipped with a vertical, tubular upper inlet for the introduction of aerated secondary sludge into the thickener. Below the inlet, a second feedwell passes primary sludge into the tank below the secondary sludge. The upper inlet has a closed bottom and an open top, while the reverse is true for the lower, adjacent inlet. Mounted within the tank and extending radially from the upper feedwell is a circular partition

which divides the tank into concentric portions. A liquid extraction apparatus mounted on the tank wall withdraws liquid from the outer ring of the tank to maintain a constant fluid level. Within the center ring area, floating solids on the surface of the confined liquid sludge are removed. A valve at the bottom of the tank collects and removes solids which settle from the liquid. (Lisk-FIRL) W78-11083

**TANK FOR AGITATION AND AERATION OF SEWAGES,**

Biuro Projektowo-Konstrucyjne Centralnego Związku Spółdzielni Mleczarskich, Warsaw (Poland). (Assignee).  
R. Przybyłowicz, and C. Zabierzewski.  
United States Patent 4,080,292. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol 968, No 3, p 1094, March, 1978. 1 fig.

Descriptors: \*Aerated lagoons, \*Activated sludge, \*Patents, \*Turbidity, \*Aeration, \*Equipment, \*Design data, \*Suspended solids, \*Waste water treatment, \*Sewage treatment, \*Municipal wastes.

A waste water aeration basin that provides both horizontal and vertical agitation has been patented. The basin consists of a rectangular tank equipped with turbine aerators which rotate around a vertical axis. The aerators are spaced around the interior of the tank, separated by vertical partitions. The partitions divide the aeration tank into two sections which are connected by adjacent ditches. The method of aeration uses a brush which rotates around a horizontal axis transversing the two ditches. Vertical and horizontal turbulence is generated by the aerators and brush in the waste water. The activated sludge in the treatment tank is thus maintained in suspension throughout the tank during aeration, ensuring even distribution of the microorganisms. (Lisk-FIRL) W78-11093

**METHOD FOR REMOVING PHOSPHATES FROM AQUEOUS SOLUTIONS,**  
Chemische Fabrik, Uetikon (Switzerland). (Assignee).

K. Klantschi, and A. Aregger.  
United States Patent 4,080,290. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol 968, No 3, p 1093, March, 1978.

Descriptors: \*Phosphorus, \*Phosphates, \*Patents, \*Nutrient removal, \*Absorption, \*Salts, \*Metals, \*Cations, \*Organic compounds, \*Organic acids, \*Waste water treatment, \*Municipal wastes.

A technique to selectively remove phosphorus from aqueous solutions and waste water has been patented. The phosphorus-bearing solution is initially contacted with a water insoluble complex of multivalent metal cations. The metal cations are complexed with organic ligands coordinated by treating the ligands with a salt solution of the multivalent metal cations. The organic ligand coordinated complex is then washed with water until the wash water no longer contains traces of the salt solution and has been neutralized. Phosphorus in the waste water or aqueous solution is absorbed onto the coordination complex of multivalent metal cations. (Lisk-FIRL) W78-11094

**APPARATUS FOR TREATING WASTE WATER OR SOLUTION,**

Hitachi Ltd., Tokyo (Japan). (Assignee).  
K. Kabara, T. Ogawa, S. Takahashi, S. Nishimura, and S. Kikawa.  
United States Patent 4,080,289. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol. 968, No. 3, p 1093, March, 1978. 1 fig.

Descriptors: \*Membrane processes, \*Calcium, \*Fluorides, \*Patents, \*Aluminum, \*Solubility, \*Design criteria, \*Equipment, \*Separation



techniques, Waste water treatment, Municipal wastes.

A membrane separation apparatus for removing calcium and fluoride from a waste water stream has been patented. The waste water bearing the fluoride and calcium is initially pretreated before introduction into the membrane separation apparatus. An additive containing aluminum ions is mixed with the waste water. The aluminum ions cause the formation of water soluble fluoride complexes. The pretreated waste water bearing the soluble fluoride complexes is introduced into the membrane separation apparatus where the waste is separated into two fractions. The membrane separates the pretreated waste water into a permeated liquid fraction and a concentrated liquid fraction. Means are provided in the apparatus for introducing of the waste water and the aluminum ion additive. (Lisk-FIRL)  
W78-11124

**WASTEWATER DISINFECTION IN CANADA, A BACKGROUND PAPER.**  
Environmental Protection Service, Ottawa (Ontario). Water Pollution Control Directorate. Economic and Technical Review Report No. EPS 1-WP-78-4, May 1978, 91 p, 172 ref, 7 tab, 3 append.

Descriptors: \*Waste water (Pollution), \*Waste water treatment, \*Disinfection, \*Chlorination, \*Byproducts, Effects, Aquatic life, Water users, Environmental effects, Pathogenic bacteria, Costs, \*Canada, \*National policy (Canada).

In September 1976, at the request of the Deputy Minister, Department of the Environment, an interdepartmental working group was formed to review available data on disinfection practices in Canada and to establish a technical basis upon which a national policy on wastewater disinfection could be developed. One year later, in October 1977, the interdepartmental committee completed its technical review and drafted this document summarizing its findings. The report summarizes existing wastewater disinfection requirements throughout Canada, and in the United States and Europe. The effectiveness of chlorination in combating the spread of waterborne disease is assessed, and the possible effects of residual chlorine and chlorination byproducts on man and aquatic species are discussed. Disinfection alternatives are reviewed with respect to their effectiveness in reducing pathogens, availability, relative costs, environmental impact and other practical considerations. Emphasis has been placed on the need to recognize the dual requirements for protection of both public health and the environment in formulating policies and criteria for wastewater disinfection. (WATDOC)  
W78-11198

**CULTURED DAPHNIDS AS A BIOLOGICAL WASTEWATER TREATMENT SYSTEM FOR OXIDATION POND EFFLUENT CLARIFICATION.**  
New York Cooperative Fishery Unit, Ithaca. D. G. Heimlich, S. Perrella, and J. G. Nickum. Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 933. Price codes: A04 in paper copy, A01 in microfiche. Center for Environmental Research, Cornell University, Ithaca, N.Y., July 1978. 64 p, 20 fig, 17 tab, 49 ref, 1 append. OWRT A-065-NY(1), 14-34-0001-6033, 7067, 7068.

Descriptors: \*Daphnids, Oxidation ponds, \*Biological treatment, Algae removal, Water pollution, \*Culture systems, \*Waste water treatment.

The technical feasibility of culturing *Daphnia magna* in flowing water and their function as biological filters for removing algae from the effluent of simulated oxidation ponds was demonstrated. Greatest daily increases in daphnid popu-

lation biomass in 5.5 liter culture vessels were observed in populations receiving flows of low algal concentration (3 mg/l) and high flow rate (240 ml/min). The maximum four day average increase for three replicate populations of that treatment was 136 mg (dry weight)/liter/day. Water leaving the culturing vessels of the 3 mg/l X 240 ml/min treatment had significantly lower concentrations of total nitrogen, total phosphorus, and volatile suspended solids than water entering the vessels; however, control vessels with no daphnid populations achieved similar reductions in total nitrogen and total phosphorus. Concentrations of volatile suspended solids were reduced significantly in vessels containing daphnids in comparison to control vessels. Concentrations of ammonia nitrogen and orthophosphate increased significantly in passing through culture vessels containing daphnid populations.  
W78-11214

**THE EFFECTS OF THE USE AND REGULATION OF SEPTIC TANK SYSTEMS UPON LAND USE IN MASSACHUSETTS.**  
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning. For primary bibliographic entry see Field 5G.  
W78-11216

**AN EVALUATION OF THE APPLICATION OF A DUAL-FUNCTIONAL FILTER TO DEWATERING NEUTRALIZED ACID-MINE-WATER SLUDGE.**  
West Virginia Univ., Morgantown. Water Research Inst.

J. D. Henry, and C. H. A. Kuo. Available from the National Technical Information Service, Springfield, VA 22161, as PB-285 990, price codes: A04 in paper copy, A01 in microfiche. Information Report 10, (WRI-WVU-78-01), 1978. 55 p 15 fig, 5 tab, 22 ref, 1 append.

Descriptors: \*Acid mine water, \*Cost analysis, \*Design criteria, \*Filtering systems, \*Filtration, \*Mine water, \*Sludge treatment, \*Dewatering, Evaluation, \*Filters, Mathematical model, Sludge, Treatment facilities, Waste treatment, Water pollution, Water quality, Waste water treatment, Decantation, Design procedure, \*Dual-functional filters.

The dual-functional filter, a solid-liquid separation device employing both the mechanisms of filtration and settling or decantation, includes a filtration and dump cycle where settling occurs. A design equation for the filter was developed which facilitated data interpretation and assessment of the feasibility of the process. Alternatives for integrating the dual-functional filter with acid-mine-water-treatment processes were evaluated. Economic evaluation of the costs of a clarifier-filter sequence was used to determine the optimum. Extent of dewatering prior to filtration. The optimum interstage-slurry concentration between the clarifier and the dual-functional filter for the vase case is 0.6 wt-percent. The total treatment cost is 10.3 cents per 1000 gallons. Economic-sensitivity analyses illustrate the effect of changes in the fractional redispersion of the filter cake, cycle time, and hose life. The economics are labor controlled. The labor cost is approximately 70 percent of the total treatment cost for the vase case.  
W78-11218

**SYMBIOTIC MEMBRANE SYSTEMS.**  
United States Patent 4,080,288. Issued March 21, 1978. Official Gazette of the United States Patent Office, Vol 968, No 3, p 1092-1093, March, 1978. 1 fig.

Descriptors: \*Semipermeable membranes, \*Membrane processes, \*Patents, \*Organic wastes, \*Biological treatment, Biodegradation, Mem-

branes, Nitrogen, Oxygen, Biomass, Waste water treatment.

A patent has been issued for a symbiotic membrane treatment system to remove liquid organic and inorganic waste from sewage effluent. Biological treatment of the waste water is enhanced by the presence of nitrogen and oxygen. Waste water introduced into the biomass in the reactor is maintained in an ambient atmosphere by the permeation of selected gases through a membrane which is located between the biomass and the gaseous phase in the reactor. The semipermeable membrane, which allows the ambient gases for biological treatment to reach the biomass, maintains contact between the gaseous phase and the biomass for a period of time adequate for biological degradation of the organic and inorganic wastes. The treated biomass is then removed from the reactor. (Lisk-FIRL)  
W78-11223

**APPARATUS FOR TREATING SEWAGE.**  
American Water Recycling Co., Apache Junction, AZ. (Assignee).  
L. R. Adams. United States Patent 4,070,292. Issued January 24, 1978. Official Gazette of the United States Patent Office, Vol 966, No 4, p 1494, January, 1978. 1 fig.

Descriptors: \*Biological treatment, \*Aeration, \*Patents, \*Design data, \*Equipment, Baffles, Aerated lagoons, Settling basins, Disinfection, Waste water treatment, Municipal wastes.

An extended aeration system providing continuous waste water treatment has been patented. A treatment tank with a curved end was has a perforated transverse baffle which divides the tank into a primary chamber and a mixing chamber. The waste water is introduced into the primary chamber and a mixing chamber. The waste water is introduced into the primary chamber where it is aerated and pumped into the mixing chamber through the perforated baffle. The mixing chamber contains an inlet, an outlet, and an ejector mounted in a conduit for decanting liquid from the mixing chamber. The withdrawn liquid is discharged through the outlet towards the curved wall of the tank, establishing circular flow between the mixing tank and the primary tank. During the circular flow, the larger particles are retained within the primary tank where they are organically degraded. The clarified liquid from the mixing tank is removed by a separate pumping apparatus which transports the liquid to a storage tank for chemical disinfection. (Lisk-FIRL)  
W78-11234

**WASTE WATER TREATMENT WITH OXYGEN.**  
Chemetron Corp., Chicago, IL. (Assignee).  
E. Abrams, and A. J. Masella. United States Patent 4,069,147. Issued January 17, 1978. Official Gazette of the United States Patent Office, Vol 966, No 3, p 1114, January, 1978.

Descriptors: \*Biological treatment, \*Biochemical oxygen demand, \*Activated sludge, \*Patents, \*Oxygenation, Microbial degradation, Oxygen demand, Oxygen, Design criteria, Waste water treatment, Municipal wastes.

A biological waste treatment process which effectively reduces the oxygen requirements during microbial degradation has been patented. Waste water with a high BOD concentration is mixed with a biologically active mass which metabolizes BOD. The BOD of the influent is reduced by the activated mass without the need for extensive oxygenation. The BOD-rich biological activated mass and liquid are clarified and separated into the BOD-rich mass and clarified liquid. A portion of the activated mass is discharged and the remainder is transferred to an oxygenation tank where it is contacted with a gas containing 30% oxygen by

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5D—Waste Treatment Processes

volume. The oxygenation of the biological mass reactivates it before transfer back to the initial waste water mixing tank. (Lisk-FIRL)  
W78-11238

**THE DEVELOPMENT OF AN INTEGRATED SYSTEM FOR WATER QUALITY MANAGEMENT PLANNING.**  
Connecticut Univ., Storrs.  
For primary bibliographic entry see Field 5G.  
W78-11242

**ALGAL CULTURE IN THE LIQUID PHASE OF ANIMAL SLURRY—EFFECT OF LIGHT AND TEMPERATURE UPON GROWTH AND PHOSPHORUS REMOVAL.**  
Queen's Univ. Belfast (Northern Ireland). Dept. of Agricultural and Food Chemistry.  
M. K. Garrett, S. T. C. Weatherup, and M. D. B. Allen.  
Environmental Pollution, Vol. 15, No. 2, p 141-154, February 1978. 4 fig, 3 tab, 7 ref.

Descriptors: \*Nutrient removal, \*Waste water treatment, \*Slurries, \*Chlorella vulgaris, \*Light, \*Temperature, Phosphorus, Plant growth, Nutrients, Equations, Regression analysis, Beneficial use, Recycling, Northern Ireland, Chlorophyta, Algae.

Effects of light and temperature on growth of the chlorophyte *Chlorella vulgaris* and phosphorus removal in the liquid phase of pig slurry were studied as part of a series of experiments on the use of micro-algae for waste treatment of animal slurry. Both light and temperature significantly affected all growth parameters and phosphorus removal except the lag phase of algal growth, which was unaffected by light. The most notable feature of the data was the complexity of effects of light and temperature interactions. Temperature was the major factor influencing both growth and phosphorus removal. Effects of light on phosphorus removal were greatest at low temperature, and temperature effects were greatest at low light. Equations relating growth and phosphorus removal to light and temperature, based on regression techniques, facilitated predictions of performance of the treatment system under local climatic conditions in Northern Ireland. Use of algae for waste treatment in the slurry is attractive because it combines recycling of nutrients, synthesis of single cell protein, and purification of a noxious byproduct. Cultures of *C. vulgaris* were grown in supernatant of pig slurry diluted 1:1 with distilled water in 1-liter Roux flasks. Cultures were continuously agitated by a current of water-saturated air. Fluorescent light was provided at intensities of 4.28, 15.34, 25.32, and 48.83 klux, and temperatures used were 5.5, 10, 15, and 19.5°C. (Lynch-Wisconsin)  
W78-11292

### 5E. Ultimate Disposal Of Wastes

**TOTAL AND ORGANIC MERCURY IN BENTHIC ORGANISMS NEAR A MAJOR SUBMARINE WASTEWATER OUTFALL SYSTEM,**  
Southern California Coastal Water Research Project, El Segundo.  
For primary bibliographic entry see Field 5B.  
W78-10544

**SALT REMOVAL EFFICIENCIES ON LAND DISPOSAL OF SWINE WASTE,**  
Alcorn State Univ., Lorman, MS.  
For primary bibliographic entry see Field 5D.  
W78-10586

**NEW JERSEY PLANT TO TURN SLUDGE INTO COMPOST.**  
For primary bibliographic entry see Field 5D.  
W78-10598

**MOTORISED VALVE SYSTEM FOR SLUDGE VESSEL.**  
Pipes and Pipelines International, vol. 23, No. 3, p 31, June 1978.

Descriptors: \*Sludge disposal, \*Valves, \*Ultimate disposal, \*Equipment, \*Electrical equipment, Remote control, Control systems, Instrumentation, Ships, Transportation, Waste water disposal, Sewage sludge, Municipal wastes.

Rotork controls Ltd. of Bath, Avon, England, designed the centralized electric valve actuators installed on the sewage sludge disposal ship, MV Garroch Head. Four valve actuators were installed on the 254 mm butterfly valves which control the loading hoppers; 22 were connected to the 500 mm equalizing and discharge valves; and 8 were mounted on the 406 mm ballast flooding valves. The actuators provide centralized and individual push-button control of the sludge loading, discharging, and ballasting operations. The ship was capable of loading 3,400 tons of sludge in one hour and discharging the cargo in about 8 min with the Rotork valve actuators. The actuators on the ballast flooding valves allowed easy trim adjustment and tuning. (Lisk-FIRL)  
W78-10674

### DUAL PURPOSE VEHICLE.

Water and Waste Treatment, Vol 21, No 6, p 25, June, 1978.

Descriptors: \*Transportation, \*Mechanical equipment, \*Solid wastes, \*Sewage, \*Sewage disposal, Rural areas, Design data, Equipment, Storage tanks, Waste water disposal, Municipal wastes, Domestic wastes.

R. Bradley Municipal Vehicles Ltd. of Clay Cross, Derbyshire, England, has begun production of a modified BMV 5000 vehicle to collect both sewage and solid refuse. Designed especially for sewage and refuse collections in rural areas, the BMV dual purpose vehicle is a modified BMV 5000 refuse collection truck equipped with two 200 gal tanks constructed of alloy welded plates. The sewage tanks, bolted beneath the truck's body, have 18 inch diameter screwsealed filler caps; the tanks are drained by gravity through 6 inch diameter convoluted hose. The standard BMV refuse collection vehicle consists of a Dodge G11 chassis with a 10-ft wheelbase containing 13.5 cu yds body space with a 1 cu yd hopper. The hopper has a rammer blade and ripper teeth for refuse collection. The BMV dual purpose vehicle will eliminate the need for two separate weekly trips to rural areas for sewage and refuse collections. (Lisk-FIRL)  
W78-10682

### PYROLYSIS OF INDUSTRIAL WASTES,

Greeley and Hansen, Chicago, IL.  
R. Srinivasaraghavan, T. E. Wilson, and M. J. Stark.

Proceedings of the 32nd Industrial Waste Conference, Purdue University, May 10-12, 1977, p 377-386. 1 fig, 19 ref, 10 tab.

Descriptors: \*Sludge treatment, \*Solid wastes, \*Pyrolysis, Wastes, Industrial wastes, Water pollution sources, Waste treatment, Sludge, Wood wastes, Animal wastes(Wildlife), Plastics, Rubber, Energy, Byproducts, Operation and maintenance, Waste disposal, Sludge disposal.

The pyrolysis process has been used experimentally to process various industrial solid wastes. In general, the solid wastes with high volatile organics and low moisture content are the most satisfactory for this process. Studies cited in the literature show that wood, plastic, rubber, and animal wastes can be pyrolyzed to derive significant quantities of energy. While no information is available on the pyrolysis of petroleum and food industry wastes, these wastes are amenable to this

process. Results from large-scale sludge pyrolysis studies are summarized. It was found that a sludge with 24% cake solids with a heat value of 9,000 Btu/lb of dry solids and a volatile content of 75% can be pyrolyzed without a supplementary fuel requirement. The benefits and disadvantages of sludge pyrolysis are outlined, and the sensitivity of pyrolysis by-products to changes in operating parameters and the potential uses of pyrolysis by-products are considered. (Witt-IPC)  
W78-10689

### FIBER SLUDGE - AN INTERESTING RAW MATERIAL (FIBERSLAM - EN INTRESSANT RAVARA).

Svenska Traeforskningsinstitutet, Stockholm.  
I. Fineman, K. Helge, and L. Soderhjelm.  
Svensk Papperstidning, Vol 81, No 4, p 110-113, March 10, 1978. 1 illus, 11 ref, 3 tab. English summary.

Descriptors: \*Sludge, \*Pulp wastes, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Solid wastes, Foreign countries, Europe, Sludge disposal, Costs, Waste disposal, Dewatering, Recycling, Soil amendments, Tiles, Economics, Transportation, Sweden, Fodder supplement, Building boards, Cement tiles, Panel boards, Bricks, Molded fiber articles.

Considerable amounts of fibrous sludge are generated yearly by the pulp and paper industry, amounting to about 180,000 tons oven-dry matter in Sweden, of which about 30% is reused. The disposal costs of the remainder average about \$13/ton and the dewatering costs about \$5 to \$40/oven-dry ton. Recycling of the fibrous sludge in the mill is the most attractive alternative, especially for sludge low in fillers and pitch. Fodder supplement and soil amendments seem to be advantageous outlets for low-ash sludges. The construction industry offers possibilities for use of high-ash sludges. The construction industry offers possibilities for use of high-ash sludges in fiber building boards and cement tiles, and of pitch- and filler-rich sludges in cement tiles. Successful trials with fibrous sludge have produced panel boards, low-density bricks, and molded fiber articles. Economics of sludge reuse must be evaluated separately in each case, as they depend on dewatering and transport costs, and to some extent also on drying costs, as well as on proper cooperation between sludge producer and consumer. (Brown-IPC)  
W78-10693

### CONTINUOUS SLUDGE DEWATERING WITH THE TUBE FILTER PRESS (KONTINUIERLICHE SCHLAMMENTWASSERUNG MIT DER SCHLAUCHFILTERPRESSE).

Wochenblatt fuer Papierfabrikation, Vol. 106, No. 2, p 73, January 31, 1978. 1 fig, 1 illus.

Descriptors: \*Sludge treatment, \*Dewatering, \*Dewatering press, Equipment, Sludge, Operation and maintenance, Wastes, Solid wastes, Waste treatment, Water pollution sources.

The Safir tube filter press developed by Bruderhaus Maschinen GmbH, Reutlingen, Germany, presses the sludge between two screen conveyor belts, which overlap to form a tube, preventing sludge being squeezed out at the sides. The design and operation of the press are described and illustrated. (Ward-IPC)  
W78-10701

### SEWAGE COULD SPREAD HEALTH HAZARD.

New Scientist, Vol 78, No 1106, p 646, June, 1978.

Descriptors: \*Application methods, \*Sewage bacteria, \*Sludge disposal, \*Viruses, \*Public health, Biological treatment, Sewage sludge, Pathogenic bacteria, Diseases, Soil amendments, Crop

response. Waste water treatment, Waste water disposal, Municipal wastes.

Potential public health hazards are identified for the land application of municipal waste water and sewage sludge containing bacteria, viruses, parasitic protozoa and helminths. The increased use of sewage-derived organic fertilizers and incorporation of land application techniques into EPA construction grant policies may increase the potential for introducing pathogens into the soil. Conventional secondary waste water treatment and chlorination may not destroy all of the pathogenic or infectious agents; techniques for analyzing viruses are selective and may not identify all types present. Viruses have been shown to be resistant to many environmental conditions; poliovirus has survived for up to 36 days on lettuce and radish crops spray irrigated with waste water. Laboratory tests on pathogen viability in waste water after treatment have often overestimated the removal efficiency of the processes. Further biological, chemical, or physical stabilization processes are recommended for primary effluent and aerobically or anaerobically digested effluent. Caution is advised in the consumption of raw vegetables harvested within 2-3 mos of spray irrigation with sewage effluent. (Lisk-FIRL)

W78-10728

#### HAZARDOUS WASTE DISPOSAL PROGRAM SEVENTH MONTHLY REPORT,

TRW Systems Group, Redondo Beach, CA.

For primary bibliographic entry see Field 5G.

W78-10760

#### WASTE WATER DISPOSAL AT FEDERAL INSTALLATIONS IN THE UNITED STATES, STATE OF CALIFORNIA.

Federal Water Pollution Control Administration, Washington, DC.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 586, Price codes: A06 in paper copy, A01 in microfiche. January, 1968, 116 p.

Descriptors: \*Administrative agencies, \*Data collections, \*Sewage treatment, \*Interagency cooperation, \*Water pollution control, Pollution abatement, Water pollution, Water quality control, Water treatment, Federal government, Surveys, Investigations, Environmental sanitation, Sanitary engineering, Sewage disposal, Water pollution sources, Documentation, Information exchange, Monitoring, Federal Water Pollution Control Act, Water policy, Administrative decisions, Regulation.

President Johnson's Executive Order 11288 required federal agencies and departments to provide leadership in the nationwide effort to improve water quality. Responsibility for the program was placed with the Federal Water Pollution Control Administration (FWPCA), which established guidelines for the prevention, control, and abatement of water pollution by federal activities. The guidelines provided for the FWPCA to review water pollution control features planned for new federal buildings, and advise the operating agency as to the systems' adequacy. As for existing facilities, the FWPCA was to provide consultation for developing plans to control pollution. Any plans for federal water resource development projects were required to be submitted to the FWPCA for recommendations, and to the Secretary of the Interior for approval. In order to monitor progress being made in the federal pollution abatement program, the FWPCA conducted a study of waste-water disposal practices at federal installations, of which this survey of 99 federal facilities in California is a part. Information surveyed included type of discharge, present treatment, present status, and proposed action. Of the 99 facilities surveyed, 37 were found to have no known water pollution problems. (Malefatto-Florida)

W78-10767

#### WATER POLLUTION ABATEMENT PROGRAM: ASSESSMENT OF FEDERAL AND STATE ENFORCEMENT EFFORTS.

Comptroller General of the United States, Washington, DC.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 287, Price codes: A04 in paper copy, A01 in microfiche. March 23, 1972, 61 p.

Descriptors: \*Federal Water Pollution Control Act, \*Water pollution control, \*Pollution abatement, \*Law enforcement, \*Water quality control, Water pollution effect, State jurisdiction, Waste water (Pollution), Permits, Environmental control, Legislation, Waste treatment, Municipal water, Sewage treatment, Water quality, Project planning, Penalties (Legal), Regulation, Governmental interrelations, Industrial water.

The assessment and evaluation of state and federal actions taken to enforce water quality requirements are discussed in this report. Previously, both the states and federal government relied primarily on voluntary compliance with water quality requirements and few enforcement actions were initiated, resulting in limited pollution abatement success. Since 1970, state and federal programs have been improved and enforcement actions vigorously pursued. States showing the greatest success include those that set both final and interim planning and construction deadlines for corrective and remedial measures. Close working relationships between the states' pollution control agencies and attorney general offices, as well as effective systems for monitoring the progress of pollution abatement are also part of the successful states' programs. Drawbacks in current federal legislation, particularly the restriction permitting the Environmental Protection Agency to commence an abatement enforcement action only after the pollution has occurred, and the merits of pending and proposed legislation are also discussed. The proposed legislation would result in more timely and forceful federal enforcement actions. It would also minimize enforcement coordination and duplication problems between states and the federal government, coordinate similar permitting problems, and keep officials informed of the status of national pollution problems. (Easterbrook-Florida)

W78-10814

#### RESERVE MINING COMPANY V. HERBST (DESIGNATION OF ALTERNATE WASTE DISPOSAL SITE AS 'FEASIBLE AND PRUDENT').

For primary bibliographic entry see Field 6E.

W78-10904

#### IMPACT OF FLUID MUD DREDGED MATERIAL ON BENTHIC COMMUNITIES OF THE TIDAL JAMES RIVER, VIRGINIA,

Virginia Inst. of Marine Science, Gloucester Point.

Div. of Biological Oceanography.

For primary bibliographic entry see Field 5C.

W78-10944

#### MODELING OF ECOLOGICAL SUCCESSION AND PRODUCTION IN ESTUARINE MARSHES,

Virginia Univ., Charlottesville. Dept. of Environmental Sciences.

For primary bibliographic entry see Field 2L.

W78-10945

#### THE FLORA OF DREDGED MATERIALS SITES IN NAVIGATION POOL 8 OF THE UPPER MISSISSIPPI RIVER,

Wisconsin Univ.-La Crosse.

S. R. Ziegler, and S. H. Sohier.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A050 778, Price codes: A06 in paper copy, A01 in

microfiche. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-31, November 1977. 97 p, 4 fig, 12 tab, 29 ref, append.

Descriptors: \*Mississippi River, Plant populations, Ecology, \*Vegetation, Plant growth, \*Dredged material, \*Waste disposal sites, \*Navigation Pool 8 (Mississippi River), Flora, Wisconsin, Minnesota.

A survey of vegetation growing on dredged material in Navigation Pool 8 of the Upper Mississippi River was made to determine plant species. Twenty-three dredged material sites in Pool 8 were surveyed and more than 3000 specimens collected of 304 species representing 64 plant families. Correlation of site ages, elevations, and plant community associations was used to determine primary colonizers of the various dredged material habitats. *Sporobolus cryptandus* (Torr.) Gray, *Triplasis purpurea* (Walt.) Chapm., *Cyperus schweinitzii* Torr., and *Cycloloma atriplicifolium* (Spreng.) Coult. were found to be pioneer herbaceous species of dry exposed dredged material sites. Upland invasion by woody species did not occur readily, but after a lengthy period species such as *Vitis riparia* Michx., *Toxicodendron rydbergii* Greene, and *Rubus occidentalis* L. encroached from surrounding forests. (WES)

W78-10947

#### TRACE AND TOXIC METAL UPTAKE BY MARSH PLANTS AS AFFECTED BY EH, PH, AND SALINITY.

Louisiana State Univ., Baton Rouge. Center for Wetland Resources.

For primary bibliographic entry see Field 5C.

W78-10949

#### A LABORATORY STUDY OF THE TURBIDITY GENERATION POTENTIAL OF SEDIMENTS TO BE DREDGED,

Abcor, Inc., Wilmington, MA. Walden Research Div.

For primary bibliographic entry see Field 2J.

W78-10951

#### COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME I: PRODUCTIVITY,

Louisiana State Univ., Baton Rouge.

For primary bibliographic entry see Field 5C.

W78-10952

#### COMMON MARSH PLANT SPECIES OF THE GULF COAST AREA VOLUME II: GROWTH DYNAMICS,

Louisiana State Univ., Baton Rouge.

For primary bibliographic entry see Field 5C.

W78-10953

#### HABITAT DEVELOPMENT FIELD INVESTIGATIONS, WINDMILL POINT MARSH DEVELOPMENT SITE, JAMES RIVER, VIRGINIA; APPENDIX C: ENVIRONMENTAL IMPACTS OF MARSH DEVELOPMENT WITH DREDGED MATERIAL: ACUTE IMPACTS ON THE MACROBENTHIC COMMUNITY,

Virginia Inst. of Marine Science, Gloucester Point.

Div. of Biological Oceanography.

For primary bibliographic entry see Field 5C.

W78-10954

#### PRIMARY PRODUCTIVITY OF MINOR MARSH PLANTS IN DELAWARE, GEORGIA, AND MAINE,

Georgia Univ., Brunswick. Marine Resources Extension Center.

For primary bibliographic entry see Field 5C.

W78-10956



## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5E—Ultimate Disposal Of Wastes

**LABORATORY STUDY OF CHEMICAL COAGULATION AS A MEANS OF TREATMENT FOR DREDGED MATERIAL,** University of Southern California, Los Angeles. Environmental Engineering Program. For primary bibliographic entry see Field 5D. W78-10957

**AQUATIC DISPOSAL FIELD INVESTIGATIONS, DUWAMISH WATERWAY DISPOSAL SITE, PUGET SOUND, WASHINGTON; APPENDIX B: ROLE OF DISPOSAL OF PCB-CONTAMINATED SEDIMENT IN THE ACCUMULATION OF PCB'S BY MARINE ANIMALS,** National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center. For primary bibliographic entry see Field 5C. W78-10959

**AQUATIC DISPOSAL FIELD INVESTIGATIONS, COLUMBIA RIVER DISPOSAL SITE, OREGON; APPENDIX E: DEMERSAL FISH AND DECAPOD SHELLFISH STUDIES,** National Marine Fisheries Service, Hammond, OR. For primary bibliographic entry see Field 5C. W78-10960

**AQUATIC DISPOSAL FIELD INVESTIGATIONS, ASHTABULA RIVER DISPOSAL SITE, OHIO, APPENDIX B: INVESTIGATION OF THE HYDRAULIC REGIME AND PHYSICAL NATURE OF BOTTOM SEDIMENTATION,** Nalco Environmental Sciences, Northbrook, IL. L. J. Danek. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, Technical Report D-77-42, December 1977. 597 p, 259 fig, 214 tab, 41 ref, 23 append.

Descriptors: \*Bottom sediments, Disposal, \*On-site investigations, Lake Erie, Ohio, \*Dredged material disposal, \*Hydraulic regime, \*Ashtabula River(Ohio), \*Waste disposal sites, \*Waste disposal.

An investigation of the hydraulic regime and physical nature of bottom sedimentation was conducted in Lake Erie near the Ashtabula Disposal Site. The field sampling phase of the program, conducted between June 1975 and September 1976, included detailed monitoring of physical parameters before, during and after disposal operations at the disposal sites and at reference stations. The various hydraulic, sedimentologic, and limnologic data gathered from the site and analyzed include bathymetry and subbottom profiles; current speed and direction, temperature, and transmissivity within the water column; wave characteristics; bottom sediment characteristics and distribution; water levels of Lake Erie, and flow rate and suspended sediment load of the Ashtabula River. The study indicated that the dredged material disposal operation had little effect on the physical nature of the area. (WES). W78-10961

**AQUATIC DISPOSAL FIELD INVESTIGATIONS DUWAMISH WATERWAY DISPOSAL SITE PUGET SOUND, WASHINGTON; APPENDIX E: RELEASE AND DISTRIBUTION OF POLYCHLORINATED BIPHENYLS INDUCED BY OPEN-WATER DREDGE DISPOSAL ACTIVITIES,** Washington Univ., Seattle. Dept. of Oceanography. For primary bibliographic entry see Field 5B. W78-10962

**BENTHOS AROUND AN OUTFALL OF THE WERRIBEE SEWAGE-TREATMENT FARM, PORT PHILLIP BAY, VICTORIA,** Victoria Ministry for Conservation, Melbourne (Australia). Marine Pollution Studies Group.

For primary bibliographic entry see Field 5C. W78-11024

**DISPOSAL AND UTILIZATION OF HYDRAULICALLY DREDGED LAKE SEDIMENTS IN LIMITED CONTAINMENT AREAS,** Massachusetts Univ., Amherst. Dept. of Civil Engineering. J. E. Walsh, and S. M. Bemben. Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 729. Price codes: A08 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRRC Pub. No. 92, Sept. 1977. 149 p, 8 tab, 45 fig, 25 photo, 88 ref. OWRT A-092-MASS(1), 14-34-0001-7046.

Descriptors: \*Dredging, \*Waste disposal, Environmental engineering, \*Lake sediments, Feasibility, Sedimentation, Dewatering, Settling basins, Containment areas, Northeastern US.

This study investigates the feasibility of using various disposal techniques to maximize the potential of a given containment area in terms of the amount and rate of sediment application and of the ultimate utilization of the area. The state-of-the-art regarding the sedimentation and dewatering of dredged lake materials is defined; and the state-of-the-art regarding lake disposal technologies, hydraulically dredged lake materials disposal problems and legal restrictions are assessed. Laboratory and field tests provide grain size distribution, specific gravity, organic content, consolidation and shear strength data for materials from eleven lakes and seven containment areas located throughout the northeastern United States. Laboratory and field studies show that sedimentation is the primary solid/liquid separation process which takes place within a dredged material containment area. Laboratory containment area simulation tests, utilizing sedimentation columns, show that the establishment of downward seepage stresses can cause significant additional compressions of fine-grained organic materials; thus the bulking factor of a dredged material is not a unique characteristic, but rather, is largely a response to effective stress changes. Of the various supernatant treatment schemes investigated in this study, only chemical treatment followed by sedimentation has been established as practical, based on actual field use. Various drainage and evaporation enhancement techniques are examined. Crustal management and underdrainage appear to be the most promising techniques for the rapid improvement of the engineering properties of containment area materials. (Idoine-Mass) W78-11067

**PHYSICAL, CHEMICAL AND BIOLOGICAL EFFECTS OF DREDGING IN THE THAMES RIVER (CT) AND SPOIL DISPOSAL AT THE NEW LONDON (CT) DUMPING GROUND,** National Marine Fisheries Service, Highlands, NJ. Middle Atlantic Coastal Fisheries Center. For primary bibliographic entry see Field 5C. W78-11229

**WATER PROBLEMS IN THE RURAL ENVIRONMENT--ALTERNATIVE SOLUTIONS FOR WATER SUPPLY AND WASTEWATER DISPOSAL,** For primary bibliographic entry see Field 3F. W78-11244

**RESERVE MINING: AN EPIC BATTLE DRAWS TO A CLOSE,** For primary bibliographic entry see Field 5G. W78-11248

**CONVERT CITY SEWAGE TO FARM FERTILIZER,** For primary bibliographic entry see Field 5G. W78-11281

**OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES,** General Accounting Office, Washington, DC. For primary bibliographic entry see Field 5G. W78-11284

### 5F. Water Treatment and Quality Alteration

**ELECTROSTATIC WATER TREATMENT,** Electrostatic Equipment Co., Kansas City, MO. (Assignee). E. A. Means, and R. C. McMahon. U.S. Patent No. 4,073,712, 12 p, 7 fig, 21 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 607, February 14, 1978.

Descriptors: \*Patents, \*Water treatment, \*Scaling, Electric fields, Water quality control, Suspended solids, Electrodes, Piping systems, Electrostatic treatment.

Many liquid clogging mechanisms, including water system scaling, involve the electrostatic relations between suspended particles, the carrier liquid and the walls of the piping network. Thus, an electrostatic field suitably impressed across a section of flowing water is believed to primarily affect not only the water, but mainly suspended, especially colloidal size, particles immersed in the water. The effect of the field will depend, upon the relationship of the natural electrostatic charge on such immersed particles to the electrostatic charge on the various surfaces of the treater and how the latter charge induces a response on the liquid contacting surfaces of the piping network. If relative conditions are proper, the particles will be urged by the field to remain in suspension or migrate toward a charged electrode isolated from the walls of the piping network, thus reducing the tendency to form flow restricting deposits. In this invention a pair of concentric cylindrical electrodes are mounted one within the other with a dielectrically isolated flow passage. The outer surface of the inner electrode and the inner surface of the outer electrode each have a layer of electrical insulation to limit current flow to and from the liquid, and a circuit is provided for continually applying D.C. potential to the electrodes. The dimensions of the inner and outer electrodes and the thickness of the insulation are determined, according to the parameters of the liquid system and the chemistry of the liquid, from a mathematical model of the treating device as the equivalent of three capacitors connected in series. (Sinha-OEIS) W78-10708

**ULTRAFILTRATION WATER COLLECTOR,** Systems Engineering and Corp., Stoughton, MA. (Assignee). J. Shorr, and H. Fishman. U.S. Patent No. 4,073,730, 7 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 612-613, February 14, 1978.

Descriptors: \*Patents, \*Water treatment, \*Water purification, \*Water quality control, Filtration, Membranes, Filters, \*Ultrafiltration.

The ultrafiltration process permits a very high level of water purification using simple mechanical means. In this process very thin plastic membranes having very tiny pores are used to remove from water all contaminants that have a particle size larger than the pore size. One important limitation on ultrafiltration systems is that the membranes must constantly be maintained in a wet condition because if they are allowed to dry they irreversibly consolidate the loss their permeability. According to this invention there is a box completely enclosing an ultrafiltration unit forming part of a larger water purification system. There are brackets for support of the unit and ports for the entrance and exit of wastewater conduits. A drain located a distance above the bottom

of the box permitted in the second drain line box permits qu so that the sy the event of fa W78-10712

**HYDROPHILIC MARINE CATALYSTS, FISH AND IN Polymetrics (Assignee) For primary b W78-10727**

**MICROBIOLOGICAL EXCHANGE PREPARATION** Rohm and Ha C. R. Costin. U.S. Patent N Gazette of the 967, no 4, p 1

Descriptors: purification, exchange, \*ganisms, Ma

This invention anion exchang physically b their meth microbiocides composition contaminate macroreticul these microb this invention chemically Both weak can be uti exchange preferred are sized are qu um, quarter and the like. W78-10730

**BAFFLE FOR GRAN General Fil J. J. Scholte U.S. Patent al Gazette Vol 967, No**

Descriptors: water tr \*Filtration, ters, Backw

Granular-m to remove treatment widespread solids from various de performan baffle cor downward of the ver significant the baffles curve dow portion of surfaces c portion of rowest cro between t fles and th loss is re high-turbu W78-1073

of the box permits a moist atmosphere to be maintained in the box during normal operations and a second drain located flush with the bottom of the box permits quick and effective isolation of a unit so that the system operation may be continued in the event of failure of the unit. (Sinha-OEIS)  
W78-10712

**HYDROPHILIC ACRYLIC POLYMERS AS MARINE FILTERS, ALGAE GROWTH CATALYSTS, AND BREEDING STIMULUS FOR FISH AND INVERTEBRATES.**  
Polymetrics International Inc., New York. (Assignee)  
For primary bibliographic entry see Field 5G.  
W78-10727

**MICROBICIDAL MACRORETICULAR ION EXCHANGE RESINS, THEIR METHOD OF PREPARATION AND USE.**  
Rohm and Haas Co., Philadelphia, PA. (Assignee) C. R. Costin.  
U.S. Patent No 4,076,622, 6 p, 5 tab, 9 ref; Official Gazette of the United States Patent Office, Vol 967, No 4, p 1571, February 28, 1978.

Descriptors: \*Patents, \*Water treatment, \*Water purification, \*Water quality control, Ion exchange, \*Anion exchange, \*Resins, Microorganisms, Macroreticular anion exchange resins.

This invention relates to large pore macroreticular anion exchange resins containing a chemically or physically bound biocide or combinations and their method of preparation and use as microbiocidal compositions. These macroreticular compositions trap and also kill the microbes in contaminated water, whereas the smaller macroreticular resins or the gel resins do not trap these microbes. The anion exchange resins used in this invention possess large pores which contain a chemically or physically bound microbiocide. Both weak and strong base anion exchange resins can be utilized, however, strong base anion exchange resins are preferred. Among the preferred anion exchange moieties that can be utilized are quaternary ammonium, tertiary sulfonium, quaternary phosphonium, alkyl pyridinium and the like. (Sinha-OEIS)  
W78-10730

**BAFFLE AND WASH TROUGH ASSEMBLY FOR GRANULAR-MEDIA FILTERS.**  
General Filter Co., Ames, IA. (Assignee)  
J. J. Scholten, and J. C. Young.  
U.S. Patent No 4,076,625, 10 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, No 4, p 1572, February 28, 1978.

Descriptors: \*Patents, \*Water treatment, \*Waste water treatment, \*Separation techniques, \*Filtration, \*Filters, Baffles, Granular-media filters, Backwashing.

Granular-media filters have been used extensively to remove suspended solids from water in water treatment plants. Such filters also are finding widespread application for removing suspended solids from wastewater streams which have had various degrees of pretreatment. In studying the performance characteristics of various trough and baffle configurations, it was discovered that downwardly moving eddy currents on the outside of the vertically-extending baffles can contribute significantly to media loss. In the preferred design, the baffles have outwardly convex portions, which curve downwardly and inwardly around the lower portion of the backwash trough. Concave inner surfaces of the baffles are opposed to the lower portion of the wash trough. The throats or narrowest cross-sections of the outflow channels are between the opposed curved portions of the baffles and the trough. The overall result is that media loss is reduced, particularly under conditions of high-turbulence backwashing. (Sinha-OEIS)  
W78-10732

**IMPROVED FEDERAL AND STATE PROGRAMS NEEDED TO INSURE THE PURITY AND SAFETY OF DRINKING WATER IN THE UNITED STATES.**

Comptroller General of the United States, Washington, DC.  
For primary bibliographic entry see Field 5G.  
W78-10813

**REMOVAL OF CHLOROFORM FROM DRINKING WATER.**  
Kentucky Water Resources Research Inst., Lexington.

J. S. Zogorski, G. D. Allgeier, and R. L. Mullins.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 819, Price codes: A05 in paper copy, A01 in microfiche. Research Report NO. 111, June 1978. 86 p, 5 fig, 24 tab, 66 ref. OWRT-A-071-KY(1), 14-34-0001-7038 and 14-34-0001-8019.

Descriptors: \*Water treatment, Water quality control, Activated carbon, Water purification, \*Chlorination, \*Chloroform removal, Potable water, \*Trihalomethanes removal.

The objective was to evaluate via laboratory experiments the technical feasibility of reducing trihalomethane levels in drinking water. Special attention was directed at the removal of chloroform since: (1) it is the only trihalomethane which has been shown to be carcinogenic in animal tests; and (2) this compound generally comprises the largest fraction of the total trihalomethane content of chlorinated waters in Kentucky. Trihalomethanes are present in municipal drinking waters due to the reaction of free chlorine with naturally occurring compounds collectively called 'precursors'. A variety of treatment processes and potential modifications (or additions) to existing treatment facilities were evaluated for precursor and trihalomethane removal. In-plant modifications which could be implemented at existing treatment facilities were evaluated initially since they require a minimal amount of capital expenditure and could be implemented within a short time. Unit treatment operations studied for precursor removal included: settling, alum-polymer coagulation, precipitative softening, ion-exchange softening, rapid sand filtration, adsorption with both powdered and granular activated carbon, and treatment with ozone and chlorine dioxide. Results from both field and laboratory studies indicate that water utilities can markedly reduce the level of trihalomethanes currently in drinking water. (Huffsey-Kentucky)  
W78-11059

**AN ALTERNATIVE METHOD OF IRON REMOVAL.**  
National Water Well Association, Worthington, OH.

T. E. Gass.  
Water Well Journal, Vol 32, No 9, p 26-27, August, 1978. 2 fig.

Descriptors: \*Iron, \*Filtration, \*Aeration, \*Water treatment, Pumps, Backwashing.

A simple method for removing iron from water supplies is described. It involves aeration and filtration. The filter medium is a combination of sand or 'anthra-filt' and graded gravel. This system will be trouble-free if the following rules are followed: (1) A minimal but steady supply of fresh air must be provided. (2) Violent mixing of air and water is not necessary. (3) Fine screens or strainers should not be used. (4) A sufficient supply of water must be capable of backwashing the filter for at least 15 minutes. This system can be used with piston or jet pumps with slight modifications; however, the system works best with a submersible pump. (Purdin-NWWA)  
W78-11073

**WATER TREATMENT: CONTAMINANTS.**

For primary bibliographic entry see Field 5D.  
W78-11079

**THE EFFECTS OF ELEVATED LEVELS OF SODIUM IN COMMUNITY DRINKING WATER ON BLOOD PRESSURE DISTRIBUTION PATTERNS.**  
Massachusetts Univ., Amherst. Div. of Public Health.  
For primary bibliographic entry see Field 5G.  
W78-11204

**WATER TREATMENT FOR SMALL PUBLIC SUPPLIES.**

New Mexico State Univ., University Park. Dept. of Chemical Engineering.  
H. G. Folster, D. B. Wilson, G. Kramer, S. Hanson, and W. Boyle.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 963, Price codes: A04 in paper copy, A01 in microfiche. New Mexico Water Resources Research Institute, Las Cruces, Report No. 095, May 1978. 53 p, 20 fig, 13 tab, 21 ref, 2 append. OWRT T-0009(No. 7515(1), 14-34-0001-7515.

Descriptors: Potable water, \*Domestic water, \*Water treatment, \*Membrane processes, \*Electrodialysis, \*Reverse osmosis, Desalination, Water supply, \*Portable demonstration Unit, \*New Mexico, Small communities, Safe Drinking Water Act.

Approximately 800 community-type public water supplies in New Mexico are initially affected by the regulations adopted by the U.S. Environmental Protection Agency under the Safe Drinking Water Act. The project described is primarily the selection, design, construction, and operating procedures for a portable demonstration water treatment system using reverse osmosis and electrodialysis to provide information to small New Mexico communities for improving their drinking water supplies to meet existing regulations. The project's specific objectives are to develop operating conditions and information for an engineering evaluation of reverse osmosis and electrodialysis and their secondary support processes, to develop specific cost data, to extend available water treatment technology in the area of single solute removal from drinking water containing a large number of ionic and dissolved species, to provide the necessary material for assimilation of this unit or comparable equipment into the educational activities of water supply and water treating, and to evaluate brine disposal methods in compliance with New Mexico groundwater regulations. Operating experiences at the selected communities will be documented as supplements to this report. (Stockton-N Mex St)  
W78-11208

## 5G. Water Quality Control

**IRRIGATION WATER SALT CONCENTRATION INFLUENCES ON SEDIMENT REMOVAL BY PONDS.**

Agricultural Research Service, Kimberly, ID.  
Snake River Conservation Research Center.  
C. W. Robbins, and C. E. Brockway.  
Soil Science Society of America Journal, Vol 42, No 3, p 478-481, May-June 1978. 2 fig, 2 tab, 12 ref.

Descriptors: \*Sediment control, \*Irrigation, \*Salts, Ponds, Water treatment, Coagulation, Flocculation, Runoff, Sediments, On-site investigations, Laboratory tests, Irrigation water, Irrigation practices, Sedimentation, \*Irrigation return flow.

Irrigation water salt concentration effects on sediment pond efficiency were investigated to demon-

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strate the necessity of considering the salt concentration in the irrigation waters when designing sediment retention ponds. The influence of dissolved salt was determined by adding concentrated CaCl<sub>2</sub> solutions to three ponds and then measuring electrical conductivities and sediment concentrations at the pond outlets. Increasing the salt concentration increased the sediment removal efficiencies when the retention time in the pond exceeded 1 hour or the inflow sediment concentration exceeded 500 ppm for the three soils studied. Adding salt to laboratory soil sample suspensions increased the settling rates for the two soils studied. That data indicated that the salt concentration in irrigation water is an important factor in determining sediment pond size and retention time. Using pond design criteria obtained from sediment ponds receiving water of a given salt concentration to design ponds that will receive water with a different salt concentration should include adjustments for salt concentration differences. A simple laboratory test was suggested to predict which soils will respond to irrigation water salt concentration changes that are likely to result in sediment pond efficiency changes. (Sims-ISWS)

W78-10521

**WATER QUALITY RESEARCH IN NEW ZEALAND 1976**, National Water and Soil Conservation Organization, Christchurch (New Zealand). S. F. Davis. Water and Soil Technical Publication No. 3, 28 p. (1977).

Descriptors: \*Water quality, \*Research and development, \*Projects, Water chemistry, Water pollution, Pollutants, Foreign countries, Eutrophication, Biology, Foreign research, Water supply, Model studies, Classification, Sampling, Surveys, \*New Zealand.

Research projects relating to water quality conducted by organizations in New Zealand during 1976 were listed. These projects were classified by subject and by organization. Addresses of contributions to this report were listed. Subjects used for classification of these research projects were: (1) development of methods for the examination, sampling, preservation and analysis of waters, (2) water quality investigations, and (3) water quality for specific uses. (Sims-ISWS)

W78-10531

**ZOOTOXICOLOGICAL ESTIMATION OF WASTE ACCOMPANYING THE PRODUCTION OF PHOSPHATES (AQUATIC ENVIRONMENT), (IN POLISH)**, For primary bibliographic entry see Field 5C. W78-10562

**A REVIEW OF THE RESTORATION OF STREAM GRAVEL FOR SPAWNING AND REARING OF SALMON SPECIES**, Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering. W. C. Mih. Fisheries, Vol 3(1), p 16-18, 1978, 3 fig, 12 ref.

Descriptors: \*Salmon, Freshwater fish, \*Fish reproduction, Methodology, On-site investigation, Fish conservation, Fish farming, Fish behavior, Sediments, Gravels, \*Stream improvement, \*Streambeds, Streams, \*Stream restoration.

Hydraulic jet action and a suction system for the removal of fine materials in natural spawning streams appear to be the best methods of clearing spawning grounds efficiently and economically. A machine will be designed, constructed and field-tested to restore salmon streams. (EIS-Katz)

W78-10563

**IMPLICATIONS OF FOREST MANAGEMENT PRACTICES ON THE AQUATIC ENVIRONMENT**, Pennsylvania State Univ., University Park. Dept. of Forestry. For primary bibliographic entry see Field 4C. W78-10565

**SOME PROPERTIES OF THE GEOMETRIC MEAN AND ITS USE IN WATER QUALITY STANDARDS**, Geological Survey, Reston, VA. Water Resources Div. For primary bibliographic entry see Field 5A. W78-10641

**GROUND-WATER POLLUTION BY NITROGEN COMPOUNDS AT OLEAN, NEW YORK--PROGRESS REPORT, JUNE 1977**, Geological Survey, Albany, NY. Water Resources Div. For primary bibliographic entry see Field 5B. W78-10649

**REAL-TIME CONTROL OF WATER QUALITY AND QUANTITY**, International Inst. for Applied Systems Analysis, Laxenburg (Austria). M. B. Beck. Research Memorandum RM-78-19, International Institute for Applied Systems Analysis, Laxenburg, Austria, April 1978. 22 p, 11 fig, 1 tab, 26 ref.

Descriptors: \*Water quality control, \*Estimating, \*Forecasting, \*Reach(Streams), \*Discharge(Water), \*Real time, River basins, Pollutants, Movement, Dispersion, Design, Least squares method, Algorithms, Equations, Mathematical models, Dissolved oxygen, Operations research, Recursive procedure, Surface storage, Fuzzy control.

Considered is the application of estimation, forecasting, and control techniques to the problem of combined real-time control of stream discharge and water quality in a river basin. A simple recursive estimation procedure is presented for the on-line estimation of pollutant movement and dispersion in a reach of river. Some important features of the linear multivariable control system design problem are then considered in the context of controlling downstream discharge and quality given an upstream effluent discharge and surface storage facility as input control variables. Because of the very basic difficulties of visualizing water quality regulation according to most conventional control engineering approaches, a final section offers a speculative examination of the possibilities for fuzzy control applications in operational river basin management. Questions which should be considered for the future, if and when real-time control becomes realistic and desirable, are stated. It is concluded that, in general, control engineering techniques of the forecasting and state estimation type are more likely to find their way into operational river basin management practice. (Bell-Cornell)

W78-10657

**IMPROVING IRRIGATION RETURN FLOW QUALITY WITH A WATER RENTAL MARKET**, Colorado State Univ., Fort Collins. Dept. of Economics. P. C. Huszar, and M. B. Sabey. Water Resources Bulletin, Vol 14, No 4, p 978-987, August 1978, 3 fig, 1 tab, 5 ref.

Descriptors: \*Irrigation, \*Return flow, \*Water quality, \*Improvement, \*Rental market, Water transfer, Water allocation(Policy), River systems, Effects, Costs, Water pollution, Conceptual model, Yakima Valley(Washington), Systems analysis.

Current policies for correcting the problem of irrigation return flow pollution tend to attack the symptoms of the problem rather than its cause. The present institutional arrangement for allocating irrigation water is seen as the source of the problem. This paper examines the water quality benefits of altering the institutional arrangement to allow for irrigation water transfers through a rental market. It is conceptualized that by creating a water rental market an opportunity cost would be associated with the use of irrigation water such that profit maximizing farmers would be induced to use water supplies more efficiently and rent the surplus to other irrigators, thus reducing return flow pollution. It is shown that a water rental market could improve water quality in the Yakima River in south central Washington by 31 percent as well as increase farm incomes and crop production. (Bell-Cornell)

W78-10658

**A PARTITIONING PROCEDURE FOR WATER QUALITY MANAGEMENT MODELS**, Environmental Protection Agency, Cincinnati, OH. L. A. Rossman, and F. T. Vanecsek. Water Resources Bulletin, Vol. 14, No. 4, p 842-855, August 1978, 2 fig, 2 tab, 25 ref.

Descriptors: \*Water quality, \*Management, \*Economic efficiency, \*Partitioning procedure, \*Optimization, Thermal pollution, Decision making, Standards, Water temperature, River systems, Dissolved oxygen, Biochemical oxygen demand, Mathematical models, Systems analysis, Equations, Cooling levels, Stream response, Non-linear programming, Gradient search procedure.

An improved computational procedure for solving water quality management models containing interacting pollutants and control policies is presented. The method is developed with respect to the specific problem of minimizing the costs of basin-wide thermal and organic pollution control to meet water quality standards. It views the problem in partitioned form where a master problem is used to find cooling levels for thermal pollutants while subproblems determine optimal organic pollutant reductions for fixed cooling levels. A gradient-based search procedure is used to solve the master problem. Computational results for several river systems are presented. Application of the method to other water quality management models is suggested. The application of this approach to complex water quality management models should improve computational efficiency and make the use of such models more attractive to basin planners. (Bell-Cornell)

W78-10660

**A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM**, Instituto Venezolano de Investigaciones Cientificas, Caracas. Lab. de Ingenieria Ambiental. D. T. O'Laoghaire. Water Resources Bulletin, Vol. 14, No. 4, p 809-826, August 1978, 1 fig, 4 tab, 34 ref.

Descriptors: \*Water quality, \*Management, \*Project planning, \*Water treatment, \*Economic efficiency, \*Optimization, \*Capacity expansion, Operating rules, Treatment facilities, Waste water(Pollution), River basins, Constraints, Biochemical oxygen demand, Dissolved oxygen, Computer programs, Capital, Investment, Integer programming, Linear programming, Branch and bound algorithm, Computer models, Operations research, Cost minimization.

Described herein are a mathematical model, an algorithm, and a computer program that were specially developed to study the problem of a water quality management system undergoing a rapidly increasing environmental stress. The model output will determine the locations, sizes and the timing



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of construction of new treatment plants plus an overall treatment plant operating policy so that environmental standards are maintained at a minimum cost. The model, as formulated, is a 0-1 mixed integer programming problem which is solved by decomposing it into a capital budgeting problem (solved by Little's branch and bound algorithm) and an operational policy problem (solved by linear programming). The coded algorithm in FORTRAN 10 has been tested with a semi-realistic example. Results are presented showing that an initial solution was found in 1.20 minutes, while the optimal solution was encountered in 7.57 minutes on a DEC 10-1077 computer. (Bell-Cornell)  
W78-10661

**AN APPROXIMATE METHOD FOR SIZING DETENTION RESERVOIRS,**  
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 4A.  
W78-10662

**EFFECTS OF CLARIFICATION PROCEDURES ON EFFLUENT DISCHARGE FEES (AUSWIRKUNGEN VON KLAERMASSENNAHMEN AUF DIE HOEHE DER ABWASSERABGABE),**  
W. Brecht.  
Wochenblatt fuer Papierfabrikation, Vol. 106, No. 1, p. 9-18, January 15, 1978. 8 fig., 14 ref., 7 tab.

Descriptors: \*Pollution taxes (Charges), \*Germany, Taxes, Suspended solids, Chemical oxygen demand, Toxicity, Mercury, Cadmium, Effluents, Water quality standards, Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Europe, Foreign countries, Standards, Pulp wastes, Tax rates, Costs, Fish.

The German waste water tax is based on the volume of effluent discharged and on its nature. The formula for calculating 'harmfulness' takes into account total suspended solids, COD, toxicity to fish, and mercury and cadmium content. The formula is discussed, and the standards for testing effluents are tabulated. The tax will increase annually each year until 1986. There is no tax if there is no effluent (16 German paper mills operated with closed water circuits in 1974) or if the harmfulness is below the limits set. Calculations given show that reduction of harmfulness reduces the tax much more effectively than does partial reduction of the amount of effluent. When both the tax level and the cost of cleaning up the effluent are considered, calculations show that removal of more than about 88% of the total harmful impurities in the effluent is too expensive to balance the tax savings. The author does not expect any tax reduction. From 1973 to 1976, the German paper industry has reduced the volume of effluent by 85% and its COD by 30%. The corresponding figures for the pulp industry are 15 and 40%. (Ward-IPC)  
W78-10700

**BARRIER FOR WATER CARRIED POLLUTANTS,**  
P. Preus.  
U.S. Patent No. 4,073,143, 7 p., 7 fig., 4 ref.; Official Gazette of the United States Patent Office, Vol 967, No 2, p. 420, February 14, 1978.

Descriptors: \*Patents, \*Water pollution control, \*Water quality control, \*Oil pollution, Oil spills, Barriers, Floats, Containment, Oil booms, Oil slicks.

A barrier for containing and controlling water carried pollutants, for example, oil, is composed of a series of boom sections which are connectable in end to end relationship with each of the boom sections containing a flotation material; generally liquid impervious connectors for the ends of the

boom sections; flexible draft members and associated separable connectors for maintaining the continuity of the boom; and means associated with the flexible draft members and the fluid impervious connectors between the boom section to reduce to a minimum separating stresses at the end of to end connections of the boom sections. (Sinha-OEIS)  
W78-10703

**SUCTION DEVICE FOR AN OIL SEPARATION TANK,**  
Bridgestone Tire Co. Ltd., Tokyo (Japan). (Assignee).  
H. Kawakami, Y. Tsukagawa, and I. Nagaoka.  
U.S. Patent No. 4,075,096, 4 p., 1 fig., 9 ref.; Official Gazette of the United States Patent Office, Vol 967, No 3, p. 1065, February 21, 1978.

Descriptors: \*Patents, \*Oil pollution, Oil spills, Water pollution treatment, \*Water pollution control, Water quality control, Separation techniques, \*Suction device.

A device for recovering floating matter from water surfaces is an improvement of a suction device for an oil separation tank. The tank is mounted on a floating body such as ships, etc. and closed at its upper part and opened at its lower part and includes a socket opened below water level for receiving an upward flow of floating oil which has been drawn into water. The improvement to the system comprises a suction inlet provided at the top of the oil separation tank, the suction inlet being connected through a conduit to a strainer, a liquid pump and a storage tank in succession. The liquid pump is driven by a motor which is electrically connected to an oil detector and an electromagnetic valve. The oil detector is provided in the upper part of the oil separation tank so as to control energization and deenergization of the motor in response to the presence and absence of oil in the oil separation tank. The electromagnetic valve is opened and closed in response to the energization and deenergization of the motor. (Sinha-OEIS)  
W78-10720

**AQUATIC HERBICIDES,**  
Nalco Chemical Co., Oak Brook, IL. (Assignee).  
J. F. Vartiak, and G. E. Wortley.  
U.S. Patent No. 4,076,516, 4 p., 2 tab., 4 ref.; Official Gazette of the United States Patent Office, Vol 967, No 4, p. 1541, February 28, 1978.

Descriptors: \*Patents, Water treatment, \*Herbicides, \*Aquatic weed control, Polymers, Submerged plants, \*Water pollution control, High molecular weight.

Many species of undesirable aquatic vegetation may be contained or controlled by treating this vegetation with a variety of aquatic herbicides. These herbicides are often applied by spraying them beneath the water's surface. Many of these aquatic herbicides are applied in conjunction with weighting agents such as sugar or as water-in-oil emulsions which are formulated so that the emulsion slowly inverts in the water. The emulsion droplets, prior to inverting slowly sink to the bottom of the water where they become affixed to the plant or to the bottom of the body of water where their activity can be focused directly against the vegetation sought to be controlled. It has been found that aquatic herbicides may be improved in their activity by applying these herbicides under water to the vegetation to be controlled in the presence of a minor amount of a water-soluble vinyl addition polymer which has a molecular weight of at least 10,000. (Sinha-OEIS)  
W78-10722

**HYDROPHILIC ACRYLIC POLYMERS AS MARINE FILTERS, ALGAE GROWTH**

**CATALYSTS, AND BREEDING STIMULUS FOR FISH AND INVERTEBRATES,**  
Polymetrics International Inc., New York. (Assignee).  
K. A. Howery.  
U.S. Patent No. 4,076,619, 6 p., 2 ref.; Official Gazette of the United States Patent Office, Vol 967, no 4, p. 1570, February 28, 1978.

Descriptors: \*Patents, \*Water treatment, \*Water pollution treatment, \*Water quality control, Seawater, Absorption, \*Polymers, Filtration, Algae, Marine life wastes, \*Hydrophilic acrylic polymers.

A hydrophilic polymeric solution or pellets or other subdivided solid forms is provided to be applied as a coating to plastic fibrous materials or plastic matrix materials used as filters or dispensed in the form of pellets or other subdivided form used as a filtration medium. It accelerates removal of marine wastes and facilitates algae growth essential to the establishment and maintenance of hearty marine life in natural or synthetic sea water. The polymeric coatings and the pelletized forms of the acrylic polymer are both hydrophilic and hydrophobic. Hydrophilic in that the acrylic polymer will pass both water vapor and gases through both the coating and pellet forms of the polymer while simultaneously absorbing water and swelling the coating and pellets. Hydrophobic in that both the coating and pellets will absorb only a predetermined amount of water, i.e. up to 20% by volume depending upon the solids percentage of the original formulation. (Sinha-OEIS)  
W78-10727

**MICROBICIDAL MACRORETICULAR ION EXCHANGE RESINS, THEIR METHOD OF PREPARATION AND USE,**  
Rohm and Haas Co., Philadelphia, PA. (Assignee).  
For primary bibliographic entry see Field 5F.  
W78-10730

**SELF-DEPLOYING BOOM,**  
Goodrich (B. F.) Co., Akron, OH. (Assignee).  
P. J. Tolan.  
U.S. Patent No. 4,076,624, 6 p., 5 fig., 5 ref.; Official Gazette of the United States Patent Office, Vol 967, no 4, p. 1571-1572, February 28, 1978.

Descriptors: \*Patents, \*Water pollution treatment, \*Water quality control, \*Water pollution control, \*Oil pollution, Oil spills, Barriers, Monitoring, \*Floating oil booms.

An effective practical means for controlling and confining oil spills on water to prevent their subsequent spread and damage is provided. It is particularly useful in areas where water traffic prevents the permanent type of installation because the known booms were deployed in such a manner that they interfered with the use of the channel waters. The oil monitoring and pollutant control apparatus of this invention comprises a flexible elongated body or boom being so folded that it can be retained in a body of water by a holding line that is secured to a boat or a dock. An oil monitoring device is mounted adjacent to the holding line so that upon detection of oil, the holding line is severed and the boom deployed. The ends of the boom are connected to mooring lines which in turn are connected to spaced mooring blocks to deploy the boom in a pre-determined attitude and locations for most effective use of containment of the pollutant material. (Sinha-OEIS)  
W78-10731

**MIXING EFFECTS DUE TO BOATING ACTIVITIES IN SHALLOW LAKES,**  
Florida Technological Univ., Orlando. Dept. of Civil Engineering and Environmental Science.  
For primary bibliographic entry see Field 5B.  
W78-10734

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5G—Water Quality Control

#### **SALINITY MANAGEMENT OPTIONS FOR THE COLORADO RIVER, DAMAGE ESTIMATES AND CONTROL PROGRAM IMPACTS,** Utah Water Research Lab., Logan.

J. C. Andersen, A. P. Kleinman, F. B. Brown, J. R. Cannon, and R. C. d'Arge.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 482, Price codes: A16 in paper copy, A01 in microfiche. Water Resources Planning Series Report P-78-003, June 1978. 344 p, 53 fig, 365 tab. 14 maps, 7 append. OWRT B-107-Utah(2), 14-31-0001-4168.

Descriptors: \*Economic efficiency, \*Resource allocation, Regional analysis, Water quality, \*Salinity, River basins, \*Agricultural damages, Water management (Applied), Estimating, Costs, \*Alternative costs, Economic impact, Input-output analysis, \*Colorado River.

Rivers draining arid basins increase in salinity content in the downstream area of the point where water users are often significantly damaged. The problem in some cases can be ameliorated by altering upstream water and land use practices. An economic trade-off exists between the cost of such upstream efforts and the downstream benefits achieved. This study sought to provide additional information to estimate (1) economic and (2) economic costs of salinity control measures by upstream water users. Damages were estimated for high salinity levels to provide guidelines to project future conditions. Control costs were estimated with a physical model developed to predict the response of soil, water, and crop factors. Input-output models were used to estimate indirect economic impacts.  
W78-10735

#### **EPA AMENDS SEWAGE PLANT FUNDING RULES.**

Engineering News-Record, Vol. 200, No. 25, p 41, June, 1978.

Descriptors: \*Grants, \*Sewage treatment, \*Treatment facilities, \*Construction costs, \*Financing, Administrative agencies, Government finance, Cost repayment, Regulation, Waste water treatment, Municipal wastes.

The EPA has amended construction grant regulations for municipal sewage treatment plants in an effort to improve grant application processing procedures and to update the regulations to conform with 1972 amendments to the Federal Water Pollution Control Act. Equipment procurement practices will be modified and awarded construction grants will be cross-referenced with waste water permits. Enforcement practices will be coordinated with grant mechanisms to monitor construction schedules. Equipment costing less than \$200,000 will no longer require commercial code equipment liens for progress payments. Retroactive application based on inflationary increases prior to December 17, 1975, will be eliminated. New provisions have been established for integrating specific treatment facilities with regional water quality. Proposed compliance with facilities planning requirements by March 31, 1980, will eliminate grace periods. (Lisk-FIRL)  
W78-10739

#### **TABANIDS IN EXPERIMENTALLY FERTILIZED PLOTS ON A MASSACHUSETTS SALT MARSH.**

Marine Biological Lab., Woods Hole, MA. Boston Univ. Marine Program.  
R. A. Meany, I. Valiela, and J. M. Teal.  
The Journal of Applied Ecology, Vol 13, No 2, p 323-332, 1976. 4 fig, 1 tab, 19 ref.

Descriptors: \*Aquatic insects, Marshes, Marsh plants, \*Salt marshes, \*Massachusetts, \*Fertilizers, Sludge, \*Sludge disposal, Phosphate, Ureas, Fertility, Fertilizers, \*Phosphate fertilizers, \*Urea fertilizers, \*Tabanids, Larval

tabanids, Tabanidae, Great Sippewissett Marsh, Buzzards Bay, Sewage sludge fertilizers.

The average larval densities for both *Tabanus nigrovittatus* and *Chrysops fuliginosus* found in control plots of 1972-73 and the 1974 plots are comparable to the maximum values for *Tabanus nigrovittatus* obtained elsewhere on the east coast of North America. Larval tabanid populations were drastically reduced in plots treated with a sewage sludge fertilizer but were unaffected by treatments with a phosphate and a urea fertilizers. (Katz-EIS)  
W78-10748

#### **BIOLOGICAL AND CHEMICAL SUCCESSION IN NAHAL SOREQ: A FREE-FLOWING WASTEWATER STREAM.**

Hebrew Univ., Jerusalem (Israel). Environmental Health Lab.  
For primary bibliographic entry see Field 5C.  
W78-10754

#### **REPORT OF THE PRESIDENT'S WATER POLLUTION CONTROL ADVISORY BOARD HELD AT HONOLULU, HAWAII ON JUNE 7-16, 1971.**

President's Water Pollution Control Advisory Board Washington, DC.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 599, Price codes: A03 in paper copy, A01 in microfiche. August 16, 1971, 33 p.

Descriptors: \*Hawaii, \*Water pollution control, \*Water pollution effects, \*Governmental interrelations, Water pollution, Water quality, Water quality control, Pollutants, Monitoring, Municipal wastes, Industrial wastes, Sewage effluents, Sewage treatment, Water pollution sources, Regulation, Pollution abatement, Water policy, Administrative agencies, Inter-agency cooperation, Sugar crops.

In June of 1971, the President's Water Pollution Control Advisory Board met in Hawaii to review that state's water pollution problems. The three-day agenda included inspection tours of Hawaii and Oahu Islands, public hearings, and an executive session where findings were drafted. A controversial incident at the hearings was the resignation of the state's deputy attorney general, who claimed the Governor had decided not to enforce water pollution control laws against the sugar industry. The Advisory Board made a number of proposals. It recommended that a full time administrator and staff be appointed to handle water pollution control. It stated construction of a sewage treatment plant should be Honolulu's highest priority. Increased monitoring by the state in recreation areas was also recommended. The Board stated that more consideration should be given to the condition of the sea floor. Lack of progress by the sugar industry in controlling its pollution along with hearing testimony, were cited as reasons for close scrutiny by the Environmental Protection Agency (EPA) of current abatement proposals. The Board also suggested that the EPA seek compliance with abatement regulations through the courts, if necessary. (Malefatto-Florida)  
W78-10755

#### **OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.**

California Univ., Berkeley. Lawrence Berkeley Lab.  
J. Young.  
Available from National Technical Information Service, Springfield, Virginia 22161 as LBL-5317. June 1976, 10p.

Descriptors: \*California, \*Oil spills, \*Oil pollution, \*Navigable waters, Accidents, Pollution, Coasts, Streams, Federal government, Environment, Facilities, Pollution abatement, Planning,

Environmental effects, Storage requirements, Storage, Electronic equipment, Pollutant identification, Laboratories, Laboratory equipment.

The policy priorities of the Lawrence Berkeley Laboratory, Berkeley, California, concerning oil and hazardous substance pollution of navigable waters and waterways are discussed in this document. The specific, localized procedures to be followed in case of a pollution accident/spill are delineated. The laboratory's initial priority is to prevent pollution through physical design and preplanning of facilities. The contingency plan assigns primary surveillance responsibility to the person handling or transporting the pollutants. Secondary surveillance is carried out by members of the Laboratory Protection Department. The primary concern in any accident/spill is to protect the environment. The nature of the pollutant, and the particular threat it poses to life, property and the environment determines the procedures taken upon the discovery of an accident/spill. In cases where the discoverer has insufficient expertise to correctly identify the corrective measures to be instituted, as procedure is outlined that is designed to notify competent civil authorities and to have responsible persons sent to the scene to evaluate the problem. In all cases, state and federal agencies and officials are to be notified as required. (Easterbrook-Florida).  
W78-10757

#### **HEARING INVOLVING 180-DAY NOTICE OF VIOLATION OF WATER QUALITY STANDARDS OF THE CITY OF FARGO, NORTH DAKOTA HELD IN FARGO, NORTH DAKOTA ON JULY 10, 1970.**

Federal Water Quality Administration, Washington, DC.  
Available from National Technical Information Service, Springfield, Virginia 22161 as PB-259 500. Price codes: A07, in paper copy, A01 Microfiche.

Descriptors: \*North Dakota, \*Adjudication procedure, \*Water quality control, \*Law enforcement, \*Governmental interrelations, Administration, Water law, Legal aspects, Cost sharing, Administrative agencies, Administrative decisions, Regulation, Comprehensive planning, Federal Water Pollution Control Act, Abatement, Water pollution control, Water quality standards, Public health, Sewage treatment, Water pollution treatment.

The city of Fargo, North Dakota was found in violation of the Federal Water Pollution Control Act in 1970. It has discharged effluent into the Red River of the North. Accordingly, hearings were convened by the Federal Water Quality Administration (FWQA). Mayor Laskowitz related Fargo's history of water pollution control, and maintained that continuing federal financial assistance was imperative. FWQA presented a report which stated that during the winter Fargo's sewage treatment system was less efficient, resulting in increased water pollution. To overcome the problem, additional treatment facilities were recommended. A representative from the North Dakota Department of Health next testified that while Fargo had violated effluent standards, even if it had not, river standards would not have been met because of pollution from other sources. The hearing officer stated that he had recommended that abatement action be taken against these sources. Fargo's water and sewage commissioner assured the hearing officer that the city would have a workable plan ready by the expiration of the 180-day notice period. The officer suggested the plan be presented thirty days sooner and that FWQA be consulted for technical assistance.  
W78-10758

#### **WATER QUALITY COMPARISON STUDY, ESCAMBIA RIVER AND OTHER NORTHWEST FLORIDA STREAMS.**

Environmental Protection Agency, Athens, GA. Surveillance and Analysis Div.

For primary:  
W78-10759

HAZARDOUS SEVENTH TRW System M. Appel, Dal Porto, Available from Service Price code: August 10,

Descriptor: \*Planning, Mercury, transportation, ment facilities identification

This is protection to the creation of sites for wastes which fare. The define at technique specified ment tech storage, hification, ment are: devices; equipment port fo processes and 32 ch cury and in the ov possible hazardous situation to for which adequate grans ne processes adequate (Easterbrook-Florida) W78-10757

FEASIBILITY AND INFORMATION SAFE DI America VA. Availabl tion Serv Price code Report I

Descriptor: \*W Abatement program Domestic ment.

The Safe pands t (EPA) n of drink folds all umbrell state en of drink selected puter-b by most Rather separation ment, h formation regions majority

## WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

### Water Quality Control—Group 5G

For primary bibliographic entry see Field 5A.  
W78-10759

**HAZARDOUS WASTE DISPOSAL PROGRAM SEVENTH MONTHLY REPORT.**  
TRW Systems Group, Redondo Beach, CA.  
M. Appel, J. L. Blumenthal, J. F. Clausen, D. F. Dal Porto, and J. R. Denson.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 369.  
Price codes: A15 in paper copy, A01 in microfiche.  
August 10, 1972, 347 p.

Descriptors: \*Solid wastes, \*Radioactive wastes, \*Planning, \*Management, \*Industrial wastes, Mercury, Classification, Poisons, Storage, Transportation, Materials, Effects, Chemicals, Treatment facilities, Regulation, Waste disposal, Waste identification.

This is part of a comprehensive Environmental Protection Agency report and plan required to lead to the creation of a system of national disposal sites for the storage and disposal of hazardous wastes which may endanger public health or welfare. The overall objective of the program is to define and evaluate the waste management techniques and policies currently utilized for a specified set of hazardous wastes. Waste management techniques to be evaluated include those for storage, handling, transport, neutralization, detoxification, reuse and disposal. Included in this document are: reports on various exhaust gas cleaning devices; descriptive reports on air correction equipment and systems; a treatment process report for radioactive waste detoxification processes; and profile reports on 19 radioactive and 32 chemical waste compounds, including mercury and mercury compounds. Also to be included in the overall program will be a description of possible new techniques for management of hazardous wastes, proof-of-principal experimentation to determine the effectiveness of techniques for which insufficient data is available for adequate evaluation, and planning of research programs necessary for developing procedures and processes for treating hazardous wastes for which adequate techniques do not now exist.  
(Easterbrook-Florida)  
W78-10760

**FEASIBILITY STUDY FOR DEVELOPMENT AND IMPLEMENTATION OF A MODEL STATE INFORMATION SYSTEM (M.S.I.S.) FOR EPA'S SAFE DRINKING WATER PROGRAM.**  
American Management Systems, Inc. Arlington, VA.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 864.  
Price codes: A07 in paper copy, A01 in microfiche.  
Report EPA-570/9-76-002-5, June 15, 1976, 114 p.

Descriptors: \*Comprehensive planning, Computers, \*Water quality standards, \*Potable water, Abatement, Administrative agencies, \*Computer programs, Cost-benefit analysis, Data processing, Domestic water, Project planning, Water treatment.

The Safe Drinking Water Act of 1974 greatly expands the Environmental Protection Agency's (EPA) responsibilities for monitoring the quality of drinking water in the United States. The Act enforces all public water systems under the regulatory umbrella of EPA, but provides for a joint federal-state enforcement system for ensuring the quality of drinking water. A preliminary survey of selected states confirmed EPA's belief that a computer-based information system would be required by most states to effectively monitor the program. Rather than have individual states embark on separate paths toward computer system development, EPA decided to develop a Model State Information System (MSIS) to assist the states and regions in implementing the program. A vast majority of the states surveyed indicated a very

strong preference for the decentralized MSIS. Individual states will undoubtedly wish to extend the use of the MSIS to suit their specific requirements. This tailoring is probably best accomplished in a decentralized system. The decentralized operation will not create a large demand on EPA for continuing system support, computer facilities, and the problems of managing a complex telecommunication system. (Jordan-Florida)  
W78-10762

**AUDIT GUIDE FOR FINAL STATE AUDITS UNDER THE CONSTRUCTION GRANT PROGRAM (FOR USE BY INDEPENDENT PUBLIC ACCOUNTANTS).**

Environmental Protection Agency, Washington, D. C. Office of Audit.  
For primary bibliographic entry see Field 6E.  
W78-10763

**WATER QUALITY STRATEGY PAPER. A STATEMENT OF POLICY FOR IMPLEMENTING THE REQUIREMENTS OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED AND CERTAIN REQUIREMENTS OF THE 1972 MARINE PROTECTION RESEARCH AND SANCTUARIES ACT.**  
Environmental Protection Agency, Washington, DC.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 495.  
Price codes: A03 in paper copy, A01 in microfiche.  
August, 1975, 35 p.

Descriptors: \*Water policy, \*Federal Water Pollution Control Act, \*Water pollution control, \*Water quality control, \*Waste treatment, Water law, Water quality, Water pollution, Legislation, Legal aspects, Federal government, Environmental control, Environment, Water quality standards, Grants, Monitoring, Planning, Projects, Control, Permits, Environmental effects.

The primary focus of this paper is to summarize the Environmental Protection Agency's (EPA) near-term and long-range water pollution control goals. The purpose is to aid agencies in the implementation of the Federal Water Pollution Control Act (FWPCA) the EPA's 1976 goals include a follow-through on the issuing of permits and the awarding of construction grants. In addition, emphasis is placed on monitoring and enforcement priorities. The completion of basin plans and a major acceleration of the construction grants program is also required. Two new priorities discussed include the areawide waste treatment management programs and a program which will address the problem of nonpoint sources of pollution. As part of phase II, the EPA will continue to decentralize water quality management responsibility to the states. Public participation will be solicited and environmental results will be examined. The program's major problem areas are discussed with the enumeration of priorities among program areas, priorities within those areas and regional priorities. The sequence of implementation of the FWPCA through 1983 is discussed, as is the current water quality and water strategy. (Quarles-Florida)  
W78-10764

**MINIMAL REQUIREMENTS FOR A WATER QUALITY ASSURANCE PROGRAM.**

Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 807.  
Price codes: A02 in paper copy, A01 in microfiche.  
Report EPA-440/9-75-010, 1976, 20 p.

Descriptors: \*Governmental interrelationships, \*Regulation, \*State jurisdiction, \*Water quality standards, \*Water sampling, Administrative agencies, Baseline studies, Federal government, Law enforcement, Legal aspects, Planning, Sampling,

State governments, Water law, Water policy, Water quality, Water quality control.

A well-planned water quality assurance program is essential to produce valid data. Quality assurance program planning is becoming increasingly more important because a large number of laboratories are producing analyses with resulting data; the equipment and procedures used for these analyses are increasing in variety and complexity; and there is an increasing need to consolidate data bases. To ensure that minimum requirements are met, this document provides guidelines for planning, developing, and implementing a successful quality assurance program. In addition, it outlines a typical Memorandum of Understanding. This memorandum is an agreement between the Environmental Protection Agency Regional Office and the State on quality assurance procedures. Overall requirements for a water quality assurance program include: (1) determining cost/manpower ratios, (2) designating a quality assurance control coordinator, (3) assessing the present level of operation, (4) calibrating sampling equipment and flow measuring devices, (5) collecting and preserving samples, (6) recording, storing and retrieving data, and (7) establishing chain of custody of samples for legal requirements. Management should recognize that an effective quality assurance program can always be improved and that it requires constant attention. (Jordan-Florida)  
W78-10765

**WASTE WATER DISPOSAL AT FEDERAL INSTALLATIONS IN THE UNITED STATES, STATE OF CALIFORNIA.**

Federal Water Pollution Control Administration, Washington, DC.  
For primary bibliographic entry see Field 5E.  
W78-10767

**ACCOMPLISHMENT PLAN. REGION VIII. CHEYENNE RIVER BASIN AREA.**

Environmental Protection Agency, Denver, CO. Region VIII.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 254.  
Price codes: A03 in paper copy, A01 in microfiche.  
March, 1972, 26 p.

Descriptors: \*Water quality, \*River basins, \*South Dakota, \*Industrial waste water(Pollution), Radioactivity, Federal government, Water resources development, Water pollution treatment, Wastes, Recreation, Water quality control, Monitoring, Standards, Sediment control.

The Cheyenne River Basin was selected as a high priority area for pollution abatement and control programs because of significant pollution problems. Municipal and industrial discharges threatened the use of these waters as water supply sources and as recreational areas. Broad objectives of the accomplishment plan included quality improvement of the waters by elimination of some industrial sources and requirement of secondary municipal treatment, determination of the magnitude of toxic pollution from buried mill tailings along the rivers, determination of the mercury contamination of local fish, monitoring of radiation levels, and development of a plan to control basin-wide sediment and backend problems associated with agricultural, recreational, mining, and construction activities. Specific tasks for improving water quality were included in the accomplishment plan. Plans of accomplishment were also developed to deal with the various air and water quality objectives of the Environmental Protection Agency for this area. (Molloy-Florida)  
W78-10769

**DEVELOPING A WATER RESOURCE PLAN FOR SOUTH FLORIDA.**  
South Florida Water Management District, Tampa.

For primary bibliographic entry see Field 6B.



## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5G—Water Quality Control

W78-10770

#### OUTER CONTINENTAL SHELF OIL AND GAS AND SULPHUR OPERATIONS.

Federal Register, Vol. 43, No. 19, p 3880-17, January 27, 1978.

Descriptors: \*Environmental effects, \*Oil industry, \*On-site investigations, \*Well regulations, \*Continental Shelf, Exploration, Oil wells, Sites, Surveys, Coasts, Drilling, Legal aspects, Geologic investigations, Administration, Federal government, Regulation, Water law, Leases.

Existing procedures for submission of plans for exploration and development activities on the Outer Continental Shelf by oil and gas lessees are revised and more clearly defined by these regulations. Exploration plan: the basic requirement that no exploration activities such as geological and geophysical surveys to commence prior to submission and approval of the plan. Other changes provide for increased flexibility in final placement of wells, and require a lessee rather than the supervisor, to indicate which portions of a proposed exploration plan are believed to be exempt from disclosure under the Freedom of Information Act, before copies of the plan are transmitted to affected states. Only minor changes were made in the area of environmental report requirements. Introductory statements were redrafted to make it clear that the Environmental Report (Exploration) is not intended to be as detailed or comprehensive as the Environmental Report (Development and Production). The section on compliance with the National Environmental Policy Act was substantially reorganized to reflect the requirements of the Act. (Rule-Florida)

W78-10776

#### FEDERAL COMMON LAW OF NUISANCE IN INTRASTATE WATER POLLUTION DISPUTES.

For primary bibliographic entry see Field 6E.

W78-10784

#### CARELESS KEPONE.

Hofstra Univ., Hempstead, NY. Dept. of Chemistry. F. S. Sterrett, and C. A. Boss. Environment, Vol. 19, No. 2, p 30-37 (March 1977), 2 fig, 7 p.

Descriptors: \*Kepone, \*Insecticides, \*Chemical industry, \*Chlorinated hydrocarbon pesticides, \*Pesticide residues, \*Water pollution effects, Organic pesticides, Fishkill, Toxins, Water pollution, Toxicity, Virginia, Maryland, Chemical degradation, Effluents, Air pollution, Environmental effects, Persistence, Entomology, Pesticide toxicity, Pesticide removal, Chemical wastes.

Kepone is a water soluble, deadly insecticide that has been released into the waters and atmosphere of coastal Virginia and Maryland by industrial negligence. It affects the neurological functioning of organisms, and test reveal its acts as a cumulative poison which will affect the environment long into the future. This article chronicles the Kepone disaster that developed from 1973 through 1975 in Hopewell, Virginia. As a result of improper management and disregard of safety procedures, Kepone dust was allowed to cover the floors, equipment, outside grounds and lunch areas of the plant. The surrounding air and water was also contaminated by the dust. In addition, Kepone entered the city's sewerage system, inhibiting normal bacterial action needed for sewage treatment. Untreated sewage was then discharged in the St. James River, polluting a large part of it. Because Kepone is extremely toxic to estuarine organisms, fishing in the St. James has now been banned. To prevent future chemical disasters officials must promulgate strict standards for toxics production. Management must assure greater responsibility for the safety of its employees and our environment.

Clean-up problems and alternative insect controls are also discussed in this article. (Spector-Florida)

W78-10788

#### SHIPWRECKS, POLLUTION, AND THE LAW OF THE SEA.

Environmental Protection Agency, Washington, DC. Office of International Activities. For primary bibliographic entry see Field 6E.

W78-10790

#### APPROACH TO POLLUTION CONTROL AND LEGISLATION IN THE USA.

Water Pollution Control Federation, Washington, DC. For primary bibliographic entry see Field 6E.

W78-10793

#### REGULATORY PROGRAMS FOR NONPOINT POLLUTION CONTROL: THE ROLE OF CONSERVATION DISTRICTS.

National Association of Conservation Districts, Washington, DC. M. M. Garner. Journal of Soil and Water Conservation, Vol. 32, No. 5, p 199-204 (September-October, 1977).

Descriptors: \*Water quality control, \*Federal Water Pollution Control Act, \*Pollution abatement, \*Water conservation, Water quality, State governments, Land use, Water resources, Erosion control, Sediment control, Irrigation water, Administration.

Conservation districts play major roles in state and areawide water quality management plans developed under Section 208 of the Federal Water Pollution Control Act (FWPCA). Conservation districts, which are usually local subdivisions of state governments, encompass most privately owned land in the nation. In the past, districts have developed programs to control land and water resources. They have been instrumental in the implementation of water quality management plans, particularly those sections related to nonpoint-source pollution, such as erosion and sediment control, animal waste management, and irrigation water management. District programs are normally conducted on a voluntary, cooperative basis. The author notes that the FWPCA Section 208 requirement of a regulatory program to control point and nonpoint sources of pollution have forced districts to re-evaluate the adequacy of a purely voluntary program. The pertinent FWPCA Section 208 provisions are discussed and examples of the current participation of five states are outlined. The need for stronger control programs is examined. Current and pending legislation that would accomplish this goal is cited. It is up to the water quality planners in each district to determine which authorities or combination thereof they will use to develop an adequate regulatory program. (Quarles-Florida)

W78-10797

#### SPECIFIC PROBLEM ANALYSIS. 1975 NATIONAL ASSESSMENT OF WATER AND RELATED LAND RESOURCES (MISSOURI REGION).

Missouri River Basin Commission, Omaha, NE. For primary bibliographic entry see Field 6E.

W78-10798

#### WATER WARS OR STREAMS OF PARADISE: DO WE HAVE A CHOICE.

April 6, 1978, 18 p.

Descriptors: \*Aquifers, \*Florida, \*Groundwater availability, \*Water pollution control, Comprehensive planning, Drainage effects, Groundwater resources, Land use, Freshwater, Water pollution effects, Wetlands, Federal Water Pollution Control Act.

Florida's freshwater supplies and the ways in which they are affected by man's various activities are the focal point of this booklet, with special emphasis upon Northwest Florida and the Tallahassee area. Initially, the authors statistically explain the scarcity of available fresh water, the quantities of water required for the production of different goods and services, and the formation and location of Florida's major aquifers, including a hydrologic cycle chart. Also examined are the ways in which water quality is affected by sewage treatment, industrial wastes, advanced water treatment processes, storm water runoff, construction, and landfills. The authors explain the harmful effects of drainage, and the interrelationships between ditches, flood damage, pollution and changing levels of the water table. The ecological importance of wetlands is also stressed. State and federal environmental legislation is examined, with particular emphasis on sections 201 and 208 of the Federal Water Pollution Control Act as amended by Public Law 92-500. In conclusion, the authors stress the need for a comprehensive and effective land use policy to avoid a critical water shortage in Florida. A selected bibliography is included. (White-Florida)

W78-10799

#### ENVIRONMENTAL PROTECTION: MODEL ORDINANCES FOR USE BY LOCAL GOVERNMENTS.

Metropolitan Council of the Twin Cities Area, MN. For primary bibliographic entry see Field 6E.

W78-10801

#### GONE WITH THE WATER--DRAINAGE RIGHTS AND STORM WATER MANAGEMENT IN PENNSYLVANIA.

Pennsylvania Dept. of Environmental Resources, Harrisburg. For primary bibliographic entry see Field 6E.

W78-10807

#### THE ECONOMIC IMPACT OF THE FEDERAL ENVIRONMENTAL PROGRAM: A REPORT TO THE SUBCOMMITTEE ON AGRICULTURE, ENVIRONMENTAL AND CONSUMER PROTECTION OF THE COMMITTEE ON APPROPRIATIONS OF THE HOUSE OF REPRESENTATIVES.

Environmental Protection Agency, Washington, DC. Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 690, price codes: A07 in paper copy, A01 in microfiche. November, 1974. 114 p.

Descriptors: \*Federal government, \*Federal Water Pollution Control Act, \*Pollution abatement, \*Environmental control, \*Economic impact, Air pollution, Economic justification, Economic prediction, Employment, Inflation(Economic), Legislation, Pesticides, Political constraints, Regulation, Administrative agencies, Social aspects, Thermal pollution, Water pollution control, Industries, Costs.

The House Subcommittee on Agriculture, Environmental and Consumer Protection was concerned with the role that the inflexibility of nationwide environmental standards may play in creating energy shortages, inflation and environmental laws and regulations, as well as those now being developed, in order to determine whether or not funds should be provided to implement these laws and regulations. The Environmental Protection Agency report assessed the economic and energy impact of standards and regulations regarding: (1) water effluent limitations; (2) new source performance standards for air pollution; (3) thermal limitations; (4) new vehicle emissions standards; and (5) ambient air quality standards. Although some economic inefficiency might result, a greater economic inefficiency was eliminated by the

## Water Quality Control—Group 5G

uniform and equitable requirements placed on industry by nationwide standards. Determination of a use category by local governments often yielded a standard that was advantageous to industry and did not adequately protect the interests of affected residents. In fact, states would sometimes compete with another to attract industries by setting pollution standards which were advantageous to industry. (Jordan-Florida)  
W78-10809

# INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS).

American Management Systems, Inc., Arlington, VA.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 863, Price codes: A03 in paper copy, A01 in microfiche. Report EPA-570/9-76-002-4 (June 15, 1976). 29 p.

Descriptors: \*Computers, \*Potable water, \*Comprehensive planning, \*Water quality, Abatement, Administrative agencies, Computer programs, Data processing, Domestic water, Freshwater, Water purification, Water quality standards.

The Model State Information System (MSIS) is a computer-based information system for use by individual states in managing the increased volume of water quality and related data that will be required to implement the recently promulgated National Interim Primary Drinking Water Regulations. While it is primarily designed for those states that do not currently have an automated system, it is also designed to provide enhanced capabilities to states with automated systems. States will have the option of selecting a base package of features, plus one or more optional features, depending on their volume of data and individual preferences. The MSIS will perform the following basic functions: (1) maintain inventory records of public water systems; (2) maintain records and provide detailed reports on violations of regulations; (3) maintain accurate records of regulatory requirements; and (4) provide compliance data to the Environmental Protection Agency in computer compatible form. The optional features of MSIS are: (1) recording of compliance schedules under variance and exemption agreements; (2) automatic scheduling of sanitation surveys; (3) recording of specific enforcement actions; and (4) listing of certified operators and automatic mailing. (Jordan-Florida)  
W78-10810

# MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM, VOLUME II: EXHIBITS.

American Management Systems, Inc., Arlington, VA.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 861, Price codes: A13 in paper copy, A01 in microfiche. Report EPA-570/9-76-002-2, June 15, 1976. 96 p.

Descriptors: Computers, \*Potable water, \*Comprehensive planning, \*Water quality, Abatement, Administrative agencies, \*Computer programs, Data processing, Domestic water, Safety, Water purification, Water quality standards.

The Model State Information System (MSIS) is a computer-based information system which can be utilized by individual states and Environmental Protection Agency regions to perform the minimum data management functions mandated by the 1974 Safe Drinking Water Act. The MSIS consists of eight subsystems: (1) public water supply inventory; (2) water quality compliance; (3) regulations; (4) federal reporting; (5) variances and exemptions; (6) enforcement actions; (7) sanitary surveys; and (8) operator and mailing. The MSIS uses standardized forms to record data, including forms for: (1) bacteriological contaminants regulation; (2) turbidity regulation; (3) variances and ex-

emptions; (4) enforcement actions; (5) laboratory table input; (6) chemical analysis; (7) violation record; (8) public water system inventory; (9) bacteria population table; (10) lists of samples in violation of chemical and radiological standards; (11) regulations on chemical, turbidity and bacteriological contaminants; and (12) code tables for contaminants, analysis methods, violations and treatment methods. Hopefully, the MSIS will eliminate the need for states to set up their own data collection systems and yet provide the flexibility to cover each situation. (Jordan-Florida)  
W78-10811

# A REPORT TO CONGRESS ON WATER POLLUTION CONTROL MANPOWER DEVELOPMENT AND TRAINING ACTIVITIES.

Environmental Protection Agency, Washington, DC. Office of Water Program Operations.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 596, Price codes: A05 in paper copy, A01 in microfiche. December 31, 1973, 97 p.

Descriptors: \*Federal Water Pollution Control Act, \*Law enforcement, \*Manpower, \*Personnel management, Administrative agencies, Human resources, Labor, Planning, Procurement, Regulation, Water quality control, Water pollution control.

Implementation of the 1972 Amendments to the Federal Water Pollution Control Act indicates that a greater number of new personnel and additional numbers of better trained personnel must be available to federal, state and local sectors than originally estimated. Such increases are attributed to intensified waste treatment plant construction; more stringent water quality standards and effluent limitations; increased regional, state and local planning requirements; and the administration and enforcement of a permit program. The current supply of professional scientists and engineers qualified in water pollution control cannot fill the technical requirements of the field under present circumstances. A 1973 study indicates serious impairments caused by under-staffing and under-training of operation and maintenance personnel. More highly skilled technicians are needed in activated sludge techniques, digestion, process control, and instrumentation in order to meet secondary treatment standards required by the new legislation. The Environmental Protection Agency water training programs continue to satisfy the needs of various employer groups and their employees. However, increased skill and knowledge requirements of personnel at all levels of government, industry and education dictate an intensified technical training effort. (Jordan-Florida)  
W78-10812

# IMPROVED FEDERAL AND STATE PROGRAMS NEEDED TO INSURE THE PURITY AND SAFETY OF DRINKING WATER IN THE UNITED STATES.

Comptroller General of the United States, Washington, DC.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 288, Price codes: A05 in paper copy, A01 in microfiche. November 15, 1973, 84 p.

Descriptors: \*Potable water, \*Public health, \*Water treatment, \*Water works, Administrative agencies, Freshwater, Recreation, Safety, Water quality, Water supply, Water utilization, Domestic water.

Much public and congressional concern has been expressed about the capability of water purification plants to adequately protect the public against biological and chemical pollutants in the water. Although the classical communicable waterborne diseases, such as typhoid, cholera, and dysentery, were generally brought under control by the

1930's, outbreaks of communicable disease from contaminated drinking water continue to occur. Local governments and utilities are responsible for constructing, operating, and maintaining water supply systems and for taking samples of water for analysis. Although the drinking water used by most people in the United States is considered safe, recent Environmental Protection Agency (EPA) studies showed that potentially dangerous water was being delivered to some consumers, particularly by small water supply systems serving populations of 5000 or less. It is recommended that EPA's administration of the interstate carrier water supply program should be improved by making sure that: (1) laboratories used to conduct bacteriological tests are certified every three years; (2) more frequent sanitary surveys of the supply systems are made; and (3) classifications of systems are revised promptly when deficiencies are found. (Jordan-Florida)  
W78-10813

# REGULATION FOR TANK VESSELS ENGAGED IN THE CARRIAGE OF OIL IN DOMESTIC TRADE.

Coast Guard, Washington, DC. Office of Merchant Safety.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 719, Price codes: A15 in paper copy, A01 in microfiche. Report CG-M-07-77, August 15, 1975. 315 p.

Descriptors: \*Coast Guard regulations, \*Oil pollution, \*Oil wastes, \*Water pollution control, Water pollution, Pollutants, Oil, Administrative decisions, Discharge measurement, Barges, Environmental control, Federal government, United States, Regulations, Water pollution sources, Oil spills, Ships, Environmental effects.

This statement assesses the environmental impact of proposed changes to the pollution regulations in Title 33, Code of Federal Regulations, by adding regulations governing the design and operation of certain United States tankships certified to carry oil in the United States domestic trade. The regulations contain stringent discharge standards for both new and existing tank vessels and require the practice of load-on-top or retention-on-board methods to curtail the discharge of oil into the marine environment. Segregated ballast is required on new tankships over 70,000 deadweight tons. The regulations also set requirements for cargo tank size limits and improved tank vessel subdivision and stability. This statement presents information on economic and safety impacts of the proposed regulations. Among the alternative measures discussed are segregated ballast requirements to smaller and existing vessels, a requirement of double bottoms or double sides, and improvement of vessel maneuvering and stopping ability. The statement also contains information on sources of pollution from tank vessels, as well as results of a study of alternatives for distribution of required segregated ballast to provide protective spaces against collision or grounding damage. (Quarles-Florida)  
W78-10815

# FOREIGN NAVIES AND ENVIRONMENTALISM.

Naval Academy, Annapolis, MD.  
For primary bibliographic entry see Field 6E.  
W78-10816

# SALINITY MANAGEMENT ALTERNATIVES FOR OIL SHALE WATER SUPPLIES.

Colorado State Univ., Fort Collins. Dept. of Economics.

G. E. Radosevich, G. V. Skogerboe, D. B. McWhorter, and W. R. Walker.  
Natural Resources Journal, Vol. 17, No. 3, p 461-475 (July, 1977).

## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5G—Water Quality Control

**Descriptors:** \*Colorado River Basin, \*Oil shale, \*Salinity, \*Water quality control, Colorado River, Interstate rivers, Irrigation water, Management, Oil, Percolating water, Saine water intrusion, Energy.

Considerable attention has been given recently to the problem of salinity in the Colorado River. Increasing salinity concentrations are threatening the utility of water resources in the downstream areas of Arizona, California, and the Republic of Mexico. At the same time, the Upper Colorado River Basin, because of its vast reserves of oil shale and near-surface coal, is becoming one of the most important areas in the United States for energy development. However, energy development will also result in increased salinity levels in the Colorado River unless mitigating alternatives are employed. The principle problem regarding return flows from oil shale plants will occur as the result of processed shale waste disposal piles. Any water percolating through the waste piles will result in considerable salt pickup. Revegetation and proper irrigation will do much to alleviate surface and subsurface return flows. Other possibilities include desalinization or deep well injection. The basin-wide, non-degradation salinity policy for the lower stem of the Colorado River requires that each development, including oil shale mining, offset any salinity detriments by making improvements on-site or somewhere else in the Colorado River Basin. (Jordan-Florida)

W78-10825

#### PROBLEM IDENTIFICATION, LEGAL ASPECTS OF FLOOD CONTROL, ALTERNATIVE CONTROL MEASURES.

Pikes Peak Area Council of Governments, Colorado Springs, CO.

For primary bibliographic entry see Field 6E.

W78-10827

#### FOURTH CIRCUIT RULES EPA MAY ISSUE PRESUMPTIVELY VALID EFFLUENT LIMITATIONS UNDER SECTION 301 OF THE FWPCA.

For primary bibliographic entry see Field 6E.

W78-10828

#### CARTER ENVIRONMENTAL MESSAGE STRESSES ADMINISTRATION, ENFORCEMENT.

For primary bibliographic entry see Field 6E.

W78-10829

#### EPA CHARTS POLICY FOR DEADLINE ENFORCEMENT.

For primary bibliographic entry see Field 6E.

W78-10830

#### EFFLUENT CHARGES AS AN ALTERNATIVE TO REGULATIONS.

For primary bibliographic entry see Field 6E.

W78-10834

#### FLORIDA'S AREA OF CRITICAL STATE CONCERN: AN UPDATE.

Florida Bureau of Land and Water Management, Tallahassee, Div. of State Planning.

For primary bibliographic entry see Field 6E.

W78-10835

#### TROUBLE AHEAD FOR CLEAN WATER.

Natural Resources Defense Council, New York.

For primary bibliographic entry see Field 6E.

W78-10837

#### THE ROLE OF INTERSTATE COMMISSIONS IN GROUNDWATER PROTECTION--THE

#### SUSQUEHANNA RIVER BASIN COMMISSION PERSPECTIVE.

Susquehanna River Basin Commission, Mechanicsburg, PA.

J. Hollowell.

Water and Sewage Works, Vol. 124, No. 9, p 102, 105 (September, 1977).

**Descriptors:** \*River basin commissions, \*Interstate rivers, \*Interstate commissions, State governments, Rivers, Water pollution control, Water quality control, Waste water disposal, Maryland, Pennsylvania, New York.

The Susquehanna River Basin Commission was created as a unique institution to deal with the complex problems of regional planning for the protection of water quality. Through the Commission, the states of New York, Pennsylvania and Maryland, and the United States government formally recognized their joint interest and responsibility to provide for effective and economical coordination of water resources efforts and programs for the conservation, management and control of the water and related natural resources of the Susquehanna River Basin. The Commission has a 50-member staff including engineers, planners, an economist, a geologist and a biologist. Although any one of the participating governmental bodies may issue permits for river projects, they must not contravene the goals or policies of the comprehensive plan. There has been a growing number of applications to the Commission for permits to discharge wastewater into the ground. The Commission has procedures by which to review the actions of individual members, and though such procedures have evaluated the issuance of those permits. This article summarizes the findings and recommendations of the Commission. (Stump-Florida)

W78-10839

#### WATER ACT'S OIL SPILL NOTIFICATION RULE SURVIVES CONSTITUTIONAL CHALLENGES.

For primary bibliographic entry see Field 6E.

W78-10843

#### SURFACE MINING RECLAMATION AND ENFORCEMENT PROVISIONS.

Office of Surface Mining, Reclamation and Enforcement, Washington, DC.

For primary bibliographic entry see Field 6E.

W78-10845

#### FEDERAL WATER POLLUTION CONTROL ACT ENFORCEMENT FROM THE DISCHARGER'S PERSPECTIVE: THE USES AND ABUSES OF DISCRETION.

Arnold and Porter, Washington, DC.

For primary bibliographic entry see Field 6E.

W78-10846

#### OCEAN DUMPING REVISITED: NEW STATUTORY DEADLINE MAY NOT STOP SEA DISPOSAL OF SEWAGE SLUDGE.

Environmental Law Reporter, Vol 7, No 12, p 10226-10229 (December, 1977).

**Descriptors:** \*Sludge disposal, \*Oceans, \*Sewage disposal, \*Water pollution sources, Water pollution, Permits, Regulation, Coasts, Shores, Water law, Sewage sludge, Legislation.

In November, 1977, President Carter signed into law an amendment to the Marine Protection, Research and Sanctuaries Act that is aimed at banning the ocean dumping of municipal sewage sludge after December 31, 1981. The amendment bolsters an existing provision in the Environmental Protection Agency's (EPA) ocean dumping regulations which prohibits the issuance of interim permits for ocean sewage sludge dumping beyond that date. The EPA has made heavy use of interim

permits, which represents its policy of allowing contaminant levels above the regulatory ceilings for a relatively short time in order to aid dumpers to gradually switch to alternative disposal methods. The EPA's progress in phasing out ocean dumping has been steady, but too slow for those congressmen from coastal states whose offshore waters were bearing the environmental burden of ocean dumping. The author criticizes this legislative dumping deadline on three counts: it contains a caveat which may destroy its effectiveness; it assumes that economically and technologically feasible alternative methods of sludge disposal can be implemented by 1981; and sewage sludge represents only a small part of the potentially harmful material dumped into the oceans each year. (Stump-Florida)

W78-10847

#### THE MOVE TO AMEND S404 OF FWPCA: HOUSE PASSES BILL LIMITING FEDERAL AUTHORITY OVER DREDGE-AND-FILL ACTIVITIES.

For primary bibliographic entry see Field 6E.

W78-10848

#### EPA AUTHORITY AND RESPONSIBILITY UNDER THE COASTAL ZONE MANAGEMENT ACT OF 1972.

Environmental Protection Agency, San Francisco, CA, Region IX.

For primary bibliographic entry see Field 6E.

W78-10851

#### THE NEW FEDERAL WATER POLLUTION CONTROL ACT AND ITS IMPACT ON NUCLEAR POWER PLANTS.

Consolidated Edison Co. of New York, Inc., New York.

J. P. Davis.

Nuclear Safety, Vol 15, No 3, p 262-73, May-June, 1974.

**Descriptors:** \*Federal Water Pollution Control Act, \*Federal jurisdiction, \*Water pollution control, \*Effluents, \*Permits, Pollution abatement, Legislation, Water pollution, Administrative agencies, Nuclear power plants, Water pollution sources, Legal aspects, Water quality control, Thermal pollution, Electric power plants, Nuclear wastes, Water cooling.

The Federal Water Pollution Control Act Amendments of 1972 (FWPCA) created a comprehensive water pollution control system with a two step program for compliance with efficient limitations. Under this program, utilization of the 'best practicable control technology currently available' must be achieved by 1977 and effluent limitations reflecting the 'best available technology economically achievable' must be realized by 1983. This article summarizes the FWPCA giving special emphasis to provisions which affect nuclear power plants. For example, nuclear power plants must now meet seven effluent limitation standards, especially toxic discharge limits, to obtain discharge permits required for continued operation. In addition the Environmental Protection Agency (EPA) has been given the authority to regulate nuclear power plant discharge through its National Pollution Discharge Elimination System permit program. Nuclear power plants must meet the 1977 and 1983 standards unless they can show that the proposed limitations are more stringent than necessary to assure protection and propagation of a 'balanced, indigenous population of shellfish, fish and wildlife in and on the body of water into which the discharge is to be made. Lastly, the EPA has been given broad inspection and monitoring powers under the FWPCA. Severe civil and criminal penalties are prescribed for noncompliance. (Spector-Florida)

W78-10861

LIABILITY FOR A COMPARE CONVEYANCE PROVISIONS For primary b W78-10863

NATIONAL STANCES FOR For primary b W78-10864

UNITED STATES CORP. (POL. RESULTING WASTE WATER) For primary b W78-10869

REVIEW OF SOURCE ACT For primary b W78-10882

CALIFORNIA CONTROL KERN COUNTY HAUSTION DOCTRINE For primary b W78-10884

NATURAL INCORPORATION WATER POLLUTION For primary b W78-10885

OIL POLLUTION For primary b W78-10889

WATER QUALITY For primary b W78-10890

STATE POLLUTION FOR PAID POLLUTION SYSTEM. For primary b W78-10891

ENVIRONMENTAL DISTRICT FORCE WASTE WATER REAU. For primary b W78-10895

STATE POLLUTION POWER PROSECUTION THROUGH CIVIL For primary b W78-10898

NATIONAL ASSOCIATION MENTAL REGULATION For primary b W78-10900



## WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

### Water Quality Control—Group 5G

**LIABILITY FOR MARITIME OIL POLLUTION: A COMPARISON OF THE MAINE COASTAL CONVEYANCE ACT WITH FEDERAL LIABILITY PROVISIONS.**  
For primary bibliographic entry see Field 6E.  
W78-10863

**NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.**  
For primary bibliographic entry see Field 6E.  
W78-10864

**UNITED STATES V. VELSICOL CHEMICAL CORP. (POLLUTION OF NAVIGABLE RIVER RESULTING FROM DISCHARGE INTO CITY WASTE WATER COLLECTION SYSTEM).**  
For primary bibliographic entry see Field 6E.  
W78-10869

**REVIEW OF PROJECTS AFFECTING SOLE SOURCE AQUIFERS.**  
For primary bibliographic entry see Field 6E.  
W78-10882

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD V. SUPERIOR COURT OF KERN COUNTY (AN EXCEPTION TO EXHAUSTION OF ADMINISTRATIVE REMEDIES DOCTRINE).**  
For primary bibliographic entry see Field 6E.  
W78-10884

**NATURAL RESOURCES DEFENSE COUNCIL, INCORPORATED V. COSTLE (WATER QUALITY CONTROL REQUIRED BY FEDERAL WATER POLLUTION CONTROL ACT).**  
For primary bibliographic entry see Field 6E.  
W78-10885

**OIL POLLUTION PREVENTION.**  
For primary bibliographic entry see Field 6E.  
W78-10889

**WATER QUALITY STANDARDS.**  
For primary bibliographic entry see Field 6E.  
W78-10890

**STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM.**  
For primary bibliographic entry see Field 6E.  
W78-10891

**ENVIRONMENTAL DEFENSE FUND, INCORPORATED V. EAST BAY MUNICIPAL UTILITY DISTRICT (UNSUCCESSFUL ACTION TO FORCE UTILITY DISTRICT TO RECLAIM WASTE WATER, RATHER THAN PURCHASE WATER FROM FEDERAL RECLAMATION BUREAU).**  
For primary bibliographic entry see Field 6E.  
W78-10894

**STATE EX REL ASHCROFT V. UNION ELECTRIC COMPANY (NORMAL ACTIVITIES OF POWER GENERATING PLANT NOT PROSCRIBED BY STATE STATUTES EVEN THOUGH THEY RESULT IN OXYGEN DEFICIENT WATER DISCHARGE).**  
For primary bibliographic entry see Field 6E.  
W78-10895

**NATIONAL INDEPENDENT MEAT PACKERS ASSOCIATION V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EFFLUENT REGULATIONS FOR MEAT PROCESSORS).**  
For primary bibliographic entry see Field 6E.

W78-10899

**FORD MOTOR COMPANY V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (ADMINISTRATIVE GUIDELINES NECESSARY TO DENYING PERMITS).**  
For primary bibliographic entry see Field 6E.  
W78-10900

**BURGESS V. M/V TAMANO (OIL SPILL ACCIDENT CAUSED BY MISPLACED BUOY).**  
For primary bibliographic entry see Field 6E.  
W78-10901

**VILLANI V. BERLE (ACTION BY NEW YORK COMMISSIONER OF ENVIRONMENTAL CONSERVATION TO CLOSE SHELLFISH LANDS IN NEW YORK BAYS UPHELD).**  
For primary bibliographic entry see Field 6E.  
W78-10903

**RESERVE MINING COMPANY V. HERBST (DESIGNATION OF ALTERNATE WASTE DISPOSAL SITE AS 'FEASIBLE AND PRUDENT').**  
For primary bibliographic entry see Field 6E.  
W78-10904

**MOBIL OIL CORPORATION V. KELLEY (STATE JURISDICTION OVER WATER POLLUTION).**  
For primary bibliographic entry see Field 6E.  
W78-10906

**ENHANCEMENT OF RELEASES FROM A STRATIFIED IMPOUNDMENT BY LOCALIZED MIXING, OKATIBBEE LAKE, MISSISSIPPI.**  
Army Engineer Waterways Experiment Station, Vicksburg, MS.  
M. S. Dortch, and S. C. Wilhelm.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 794. Price codes: A02 in paper copy, A01 in microfiche. Miscellaneous Paper H-78-1, January 1978. 15 p, 1 tab, 2 pl.

Descriptors: \*Stratification, \*Stratified flow, \*Mixing, \*Impoundments, Water quality, \*Okatibbee Lake(Miss), Mississippi, Lakes.

Tests were conducted at Okatibbee Lake, Mississippi, to evaluate the effectiveness of localized mixing for enhancing the quality of low-level, low-flow releases from a stratified impoundment. A low-energy mechanical pump (Garton pump) that consisted of a submerged ventilating fan driven by a 1.12-kw electric motor was positioned immediately upstream of and above the low-level intake. Epilimnion water was forced toward the lake bottom where it was mixed with hypolimnion water and then released through the fixed low-level flood control outlet. The quality of this water mixture was an improvement over the quality of the water released without the pump operating. It was estimated that the epilimnion water comprised about 50 percent of the total release. Use of a Garton pump to induce localized mixing upstream of a fixed low-level flood control outlet was demonstrated to be an effective and economical means of improving the quality of low-flow releases from a stratified reservoir. (WES)  
W78-10950

**OIL POLLUTION ON ISRAELI COASTS.**  
Oil Pollution South East Kent, Dover (England).  
For primary bibliographic entry see Field 5B.  
W78-10968

**CATTLE, RAINFALL AND TSETSE IN AFRICA.**  
Oxford Univ. (England). Animal Ecology Research Group.  
D. Bourn.  
Journal of Arid Environments, 1978, Vol. 1, p 49-61. 3 tab, 6 fig, 26 ref.

Descriptors: \*Animal diseases, \*Epidemiology, \*Vectors(Biological), \*Insect control, \*Tsetse, Pasture management, Africa, Carrying capacity, Environmental effects.

As population pressure has increased in Africa, the need to develop previously unexploited land has become critical. Tsetse (Glossina spp) and the diseases it transmits are present on ten million Km<sup>2</sup> of the continent and causes major constraints in the development of potentially valuable land. Tsetse control and eradication programs have, with the exception of Nigeria, Uganda, Rhodesia and S. Africa, met with only limited success. Ironically, the most dramatic implications of the tsetse programs have been from direct effects of control measures but rather from the resultant overexploitation and mismanagement of reclaimed land. In the higher rainfall areas, ecological damages tend to be the result of arable malpractice, while in the dry regions it is associated with mismanagement of livestock. This study determines the relationship between cattle distribution, rainfall, and tsetse infestation for Africa as a whole and Ethiopia in particular and compares it to the predicted optimum carrying capacity for large herds. A linear relationship is found between cattle biomass and rainfall in tsetse-free countries in Africa while cattle biomass in countries and sub-provinces with heavy infestations is substantially lower than in tsetse-free areas. Even when tsetse is eradicated from higher rainfall areas, these same areas are often degraded through mismanagement and over-exploitation. (Ticks-Arizona).  
W78-10975

**REESTABLISHMENT OF WOODY PLANTS ON MINE SPOILS AND MANAGEMENT OF MINE WATER IMPOUNDMENTS: AN OVERVIEW OF FOREST SERVICE RESEARCH ON THE NORTHERN HIGH PLAINS.**  
Rocky Mountain Forest and Range Experiment Station, Rapid City, SD. Forest Research Lab.  
A. J. Bjugstad.  
In: The Reclamation of Disturbed Arid Lands, Robert A. Wright, ed. University of New Mexico Press, Albuquerque, 1978, p 3-12, 2 fig, 10 ref.

Descriptors: \*Revegetation, \*Mine wastes, \*Mine water, \*Land reclamation, \*Soil reclamation, Land development, Land management, Coal mine wastes, Chemical wastes, Wildlife management, Drip irrigation, Mine drainage, Soil chemical properties, Soil physical properties, Great Plains, Wyoming, \*Rocky Mountain Region.

This project was initiated by the Rocky Mountain Forest and Range experiment station with the purpose of developing techniques for revegetating mine spoils and associated waters to enhance the habitat for non-game birds, deer, small mammals and waterfowl. This particular study is concerned with the Williston and Powder River Basins of the Northern Great Plains Province in the Fort Union Formation. The climates, vegetation and land use of these two basins are variable and contain continental, temperate and semiarid regions depending upon average precipitation. This area, heavily mined for lignite and subbituminous coal and bentonite clay, is being studied to develop guidelines for the establishment or reestablishment of woody species adaptable to draws and upland sites. Research has shown that dryland techniques for the reestablishment of shrub and tree species has been moderately successful on bentonite and low-salt coal spoils with green ash having a survival rate of 44% followed by Rocky Mountain juniper and Russian Olive (24%) and

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buffaloberry, Siberian peashrub, Ponderosa pine and American plum all at 7% or less. Other studies are being carried out on the use of drip irrigation, greenhouse-grown containerized planting stock, and various cultural treatments such as the use of straw, fiber mulches, fertilizer and overhead irrigation. A program to study the rehabilitation and management of impounded mine and water was begun in 1976 and is aimed at assessing how the quality of impounded water in strip mined areas relates to habitat of wildlife including aquatic organisms. Chemical and physical properties are being analyzed in an effort to develop a variety of beneficial uses for this water. (Ticks-Arizona) W78-10982

#### RESTORATION OF PRODUCTIVITY TO DISTURBED LAND IN THE NORTHERN GREAT PLAINS,

Agricultural Research Service, Mandan, ND. Northern Great Plains Research Center. J. F. Power, F. M. Sandoval, and R. E. Ries.

In: The Reclamation of Disturbed Arid Lands, Robert A. Wright, Ed. University of New Mexico Press, Albuquerque, 1978, p 33-49. 8 tab, 1 fig, 13 ref.

Descriptors: \*Land reclamation, \*Water reuse, Land development, Productivity, Coal mine wastes, Chemical wastes, Spoil banks, Mine water, Environmental factors, \*Revegetation, \*Great Plains, Recreation, Grazing, Root development, Wildlife habitats.

The increasing development of the Northern Great Plains coal fields has caused much concern in recent years over the resulting social, economic and environmental problems in this area. This paper is a review of current information on the potential for restoration of agricultural productivity to the area with special emphasis upon available natural resources and how they can be recombined for the most beneficial effect. The problem is essentially one of creating an environment on the surface mined lands that will be conducive to the efficient utilization of available water by productive vegetation. It is argued that all types of post mining land use - agricultural, grazing, wildlife, recreation, etc. - are dependent upon successful revegetation. The task, especially in the arid and semi-arid regions, is one of creating a plant rooting medium in which rainwater will be stored within the rooting zone. Effort must then be directed toward maintaining such conditions while extracting coal. Disruption of surface and groundwater regimes is inevitable although preliminary research indicates that favorable conditions can be restored by proper earth moving activities. More research is needed in this area as well as in the area of restored wildlife habitats and other ecological niches but future legislation and management practices must be based upon the natural sciences involved. (Ticks-Arizona) W78-10983

#### ASSESSMENT OF WATER QUALITY IMPACTS OF A WESTERN COAL MINE,

Argonne National Lab., IL. Land Reclamation Program. E. H. Dettmann, and R. D. Olsen.

In: The Reclamation of Disturbed Arid Lands, Robert A. Wright, ed. University of New Mexico Press, Albuquerque, 1978, p 53-67, 4 tab, 2 fig.

Descriptors: \*Water quality, \*Mine water, \*Water pollution sources, Mine drainage, Water analysis, Water reclamation, Coal mine wastes, Nitrate nitrogen, Phosphates, \*Wyoming, Ammonium compounds, Nitrogen compounds.

The potential impact of western states coal mining upon the resulting water supplies is determined by the mining technology used and the associated hydrologic, meteorologic, and geologic characteristics of the mine locality. To determine the effect of these factors upon water quality, a study

was carried out in the vicinity of the Big Horn Mine in the northwestern part of the Powder River Basin, Wyoming, between 1975-1976. Water quality was monitored upstream and downstream of mine discharge points and included measurements of PH, specific conductance, alkalinity, chloride, fluoride, sulfate, nitrogen, phosphorus and 16 metals and trace elements. All samples for a given month were collected on the same day from the two perennial streams which traverse the mine site, Goose Creek, and the Tongue River. Although many parameters were measured, the results reported were confined to the highly soluble constituents and related parameters that do not readily enter into chemical or biological reactions. Large changes in stream water quality were found only in the upstream reaches of Goose Creek and Tongue River watersheds, an intensively farmed area. Trace elements concentrations were relatively low at all stream and mine discharge points while ammonium and nitrate concentrations were found to be elevated. Ammonium nitrate explosives may have caused the elevated reading and the authors suggest that a cumulative effect of this nitrogen loading could be hazardous. Only minor effects of salinity were detected. In general, the effect of the Big Horn mine on concentrations of the dissolved and highly soluble constituents in the Tongue River was found to be small and within the range of analytical precision and short term variation in ambient concentrations. This appears to be due to the large quantities of dilution water available in the Tongue River relative to mine discharges. (Ticks-Arizona) W78-10984

#### POTENTIALS AND PREDICTIONS CONCERNING RECLAMATION OF SEMIARID MINED LANDS,

Montana Agricultural Experiment Station, Bozeman. R. L. Hodder.

In: The Reclamation of Disturbed Arid Lands, Robert A. Wright, ed. University of New Mexico Press, Albuquerque, 1978, p 149-154.

Descriptors: \*Land reclamation, \*Soil management, \*Coal mine wastes, Land management, Strip mine wastes, Chemical wastes, Spoil banks, Mine water, Mine drainage, Wildlife management, Range management, Environmental impact, Economic planning, Watershed management, Groundwater, Project planning, Forecasting.

Reclamation of mined areas in the semi-arid regions of the Western U.S. involves the analysis of multiple and interrelated site specific conditions. In describing the needs for careful preplanning investigations, this author reviews important subjects concerned either directly or indirectly with sustained reclamation efforts, including range and wildlife inventories, soil surveys, land use and grazing patterns, watershed and groundwater studies, archeological review, and overburden analysis. Core sampling, overburden analyses and three dimensional mapping are essential preplanning inventories in making realistic and reliable decisions. Other subjects considered by the author include surface water impoundments, aquifer potential and depth, and various cultural practices such as seedbed preparation and vegetation selection. It is maintained that reclamation must realistically and permanently fulfill a local economic need or it will be misused and of temporary existence. (Ticks-Arizona) W78-10985

#### SOME APPLICATIONS OF HYDROLOGIC SIMULATION MODELS FOR DESIGN OF SURFACE MINE TOPOGRAPHY,

Agricultural Research Service, Fort Collins, CO. R. E. Smith, and D. A. Woolhiser.

In: The Reclamation of Disturbed Arid Lands, Robert A. Wright, ed. University of New Mexico Press, Albuquerque, 1978, p 189-196. 3 fig, 8 ref.

Descriptors: \*Hydrologic simulation, \*Simulation analysis, Dynamic programming, System analysis, Experimental models, Computer models, Analytical techniques, Theoretical analysis, Surface water hydrology, Land reclamation, Surface erosion, Hydraulic erosion, Soil physical properties, Soil chemical properties, Land reclamation, Coal mine wastes, Mine wastes.

A brief discussion is presented of the potential utilization of hydrologic simulation models in studying surface water hydrology of reclaimed areas. It is contended that if models properly reflect processes and interactions in nature they can be used successfully to rank alternate reclamation treatments without the precise parameter values needed to predict the quantitative result of a particular treatment. An example is presented which illustrates the adequacy of a simulation model in constructing sequences of statistically representative precipitation for simulation and in comparing the hydraulic response of various possible topographic treatments; however, because reclamation problems often vary considerably from conditions for which the model has proven useful, there is a present need to establish a wider range of parameters for hydraulic erosion rates, physical relations between soil properties and erosion susceptibility and relations between density of cover and hydrologic effects. The greatest challenge for simulation modelling now lies in quantifying the dynamic changes and interrelations of erosion, vegetative establishment and surface hydraulics on reclaimed areas. W78-10986

#### WATER QUALITY IMPACTS OF HARVESTING AND REGENERATION PRACTICES,

Southern Forest Experiment Station, Oxford, MS. Forest Hydrology Lab. For primary bibliographic entry see Field 5B. W78-10996

#### THE APPROACHING CRISIS IN THE REGISTRATION OF FISHERY CHEMICALS,

Fish and Wildlife Service, La Crosse, WI. Fish Control Lab. F. P. Meyer, and R. A. Schnick.

In: Proceedings of the Thirtieth Annual Conference, Southeastern Association of Fish and Wildlife Agencies, October 24-27, 1976. Jackson, Mississippi, p 5-14, 3 tab, 14 ref.

Descriptors: \*Water quality standards, \*Fish management, \*Fish control agents, \*Pesticides, \*Herbicides, \*Piscicides, \*Aquaculture, \*Public health, Hazards, \*Toxicity, \*Lethal limit, \*Laboratory tests, Fish populations, Productivity, Environmental effects, Pesticide residues, Analytical techniques, Wildlife, 2-4-D, Copper sulfate, Path of pollutants, \*Therapeutic agents, Food and Drug Administration, \*Fishery chemicals, Registration, \*Sublethal effects.

Review of the status of chemicals used in fisheries indicates that many lack proper registrations. Regulations of the U.S. Environmental Protection Agency and U.S. Food and Drug Administration require that all existing registrations be reviewed and reregistered by October 1977. Adequate data to support reregistration are lacking for some of the most widely used chemicals. Applications of unregistered compounds are strictly prohibited under penalty of law. All phases of fishery management are directly affected. The loss of therapeutants, anesthetics, herbicides, and piscicides will be reflected in lower hatchery production, fish of poorer quality, and increased costs. Survival of fish that are in poor health when stocked will be reduced. Loss of the use of chemicals to reclaim or renovate lakes and streams will further reduce the success of stocking programs and increase management costs. Commercial producers may be unable to cope with disease and water quality problems. Researchers will be unable to maintain experimental animals in con-

consistently uniform health or to obtain high quality stock without significantly increased costs. (EIS-Katz) W78-11008

**PRELIMINARY OBSERVATIONS ON THE PRODUCTIVITY OF PERIPHYTON ATTACHED TO FRESHWATER ARTIFICIAL TIRE REEF.**  
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Fisheries and Wildlife Sciences.  
For primary bibliographic entry see Field 5C. W78-11021

**SOME RESULTS OF INVESTIGATIONS OF THE CYCLE OF MATTER AND THE BIOLOGICAL SELF-PURIFICATION OF LAKES AND STREAMS.**  
Akademiiy Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.  
For primary bibliographic entry see Field 5C. W78-11022

**ASSESSING THE SOCIAL EFFECTS OF WATER QUALITY MANAGEMENT PROGRAMS.**  
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.  
G. E. Willeke.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 710. Price codes: A05 in paper copy, A01 in microfiche. Report ERC 03-78, April 1978. 71 p, 6 fig, 3 tab, 14 ref, append. OWRT A-067-GA(1), 14-34-0001-6011.

Descriptors: \*Social impact, \*Economic impact, Equity, \*Carrying capacity, Planning, Water quality control, Management, \*City planning, \*Methodology, \*Cost analysis, \*Subsidies, \*Wastewater management, Urban development, Atlanta(Ga).

An assessment of social and economic effects of wastewater management plans in the Atlanta, Georgia metropolitan region was attempted. It was undertaken partly for development and testing of methodology and data base requirements, and partly for effect assessment per se. A ground-up community analysis was the initial methodological approach. It was not successful because issue salience shifted to the very visible issues of water supply shortly after the wastewater planning began. Delays in plan preparation and dissemination and the lack of an effective public participation program further hampered this approach. A macro-analysis, focusing on community development over time was adopted as the second approach. This analysis relied heavily upon map interpretation for the period of rapid growth, 1959-1975. Records on sewer and water line construction were too poor to be used without extensive work. Theoretical analysis centered on issues of cost incidence and subsidies provided by existing residents to new residents, and carrying capacity. The widely scattered development pattern of DeKalb County in the late 1960s and early 1970s suggests the consideration of service districts and rate structure revision to reduce the amount of subsidy provided by existing residents to new residents. The value of ad valorem taxes for paying sewer construction costs under certain conditions is also demonstrated. Carrying capacity is re-interpreted to make it useful in the context of urban development, where social, political, and economic decisions are very important relative to natural factors such as soils and water availability. Carrying capacity is multidimensional, dynamic, and socially defined. Information requirements for its use are discussed. W78-11062

**PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME I. SUMMARY REPORT AND VERIFICATION.**  
Bureau of Reclamation, Denver, CO. Engineering and Research Center.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 901. Price codes: A04 in paper copy, A01 in microfiche. Report EPA-600/2-77-179a, August 1977. 59 p, 5 fig, 2 tab, 6 ref.

Descriptors: Water quality, Return flow, Irrigation, Irrigation effects, Model studies, Salinity, Dissolved solids, Simulation analysis, Groundwater, Hydrology.

This volume outlines the purpose and scope of the return flow research and explains the capabilities of the conjunctive use model for predicting the mineral quality of irrigation return flow. The purpose of the research was to develop a conjunctive use model for predicting the mineral quality of irrigation return flow. The purpose of the research was to develop a conjunctive use model which would (1) predict the salinity contribution from new irrigation projects and (2) predict the change in return flow salinity that would result from operational changes on existing projects. The model describes the chemical quality in terms of eight ionic constituents and total dissolved solids. A nodal concept has been used to facilitate subdividing the project area along physical or hydrologic boundaries as desired. The study may be limited to 1 or as many as 20 nodes. (See W78-11089 thru W78-11092) (Skogerboe-Colorado State) W78-11088

**PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME II. VERNAL FIELD STUDY.**

Bureau of Reclamation, Denver, CO. Engineering and Research Center.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 902. Price codes: A08 in paper copy, A01 in microfiche. Publication No. EPA-600/2-77-179b, August, 1977. 106 p, 45 fig, 9 tab, 1 append.

Descriptors: Utah, Groundwater, Water quality, Irrigation, Irrigation water, Return flow, Crop production, Soil chemistry, Simulation analysis.

This volume details the field investigations conducted to develop and validate the 'Simulation Model of Conjunctive Use and Water Quality for a River System of Basin' as given in Volume III. The studies were conducted in Ashley Valley, near Vernal, Utah. The investigations included: the quantity and quality of groundwater, irrigation water, and return flows; crop inventory and consumptive use; soil chemistry; and hydrological units to define nodes. (See also W78-11088) (Skogerboe-Colorado State) W78-11089

**PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME III. SIMULATION MODEL OF CONJUNCTIVE USE AND WATER QUALITY FOR A RIVER SYSTEM OR BASIN, USER'S MANUAL.**  
Bureau of Reclamation, Denver, CO. Engineering and Research Center.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 903. Price codes: A13 in paper copy, A01 in microfiche. Publication No. EPA-600/2-77-179c, August, 1977. 285 p, 43 fig, 18 tab, 1 append.

Descriptors: Computer programs, Simulation analysis, Model studies, Irrigation, Irrigation effects, Return flow, Water quality.

This volume documents the development of a digital computer coded simulation model to predict the effect of irrigation of agricultural lands on the

resulting irrigation return flow quality. The model is capable of simulating conjunctive uses of water, however, validation for this purpose was not performed. The model developed in this volume is much less rigorous than that presented in Volume V, however, it can be used to provide an assessment of water quality trends due to irrigation at much less cost than the detailed model. A user's manual is included. (See also W78-11088) (Skogerboe-Colorado State) W78-11090

**PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME IV. DATA ANALYSIS UTILITY PROGRAMS.**

Bureau of Reclamation, Denver, CO. Engineering and Research Center.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 904. Price codes: A11 in paper copy, A01 in microfiche. Publication No. EPA-600/2-77-179d, August, 1977. 222 p, 1 ref.

Descriptors: Return flow, Irrigation effects, Water quality, Computer programs, Model studies, Simulation analysis.

This volume contains a description of the data analysis subroutines developed to support the modeling effort described in Volume III. The subroutines were used to evaluate and condition data used in the conjunctive use model. The subroutines include (1) regression analysis, (2) Gaussian probability function, (3) Beta distribution, and (4) Pearson's incomplete gamma function. For each of these subroutines, a brief theory is given plus a program listing and sample problem. (See also W78-11088) (Skogerboe-Colorado State) W78-11091

**PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW, VOLUME V. DETAILED RETURN FLOW SALINITY AND NUTRIENT SIMULATION MODEL.**  
Bureau of Reclamation, Denver, CO. Engineering and Research Center.

M. J. Shaffer, R. W. Ribbens, and C. W. Huntley.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 705. Price codes: A11 in paper copy, A01 in microfiche. Report EPA-600/2-77-179e, August 1977. 228 p, 30 fig, 17 tab, 24 ref, append. 1HB617, EPA-1AG-D4-0371.

Descriptors: \*Mathematical models, Digital simulation, Scheduling, Irrigated land, Evapotranspiration, Agriculture, Water pollution, Water loss, \*Water quality control, \*Salinity, \*Nutrients, \*Irrigation return flow.

A return flow quality simulation model is described which models the plant-soil-aquifer system from the soil surface to a tile or open drain. Processes simulated include evapotranspiration, unsaturated and saturated water flow, solution-precipitation of slightly soluble salts, ion exchange, ion pairing, nitrogen transformations, crop uptake of nitrogen, and the movement and redistribution of salts and nutrients. The dynamic non-steady-state model predicts the concentrations of calcium, magnesium, sodium, ammonium, bicarbonate, carbonate, chloride, sulfate, N03-N, and Urea-N contained in soil, aquifer, and drain water. Concentrations of organic-N; exchangeable calcium, magnesium, sodium, and ammonium; and gypsum are predicted within the soil and aquifer materials. Users' manuals for each basic subprogram are included, and a sample problem illustrates the use of the model. Model output can serve as input to the conjunctive use model. Model output can serve as input to the conjunctive use model described in Volume III; serve as input to other models on a nodal or point source basis; or stand alone depending on the type and scope of the particular study. (See also W78-11088) W78-11092



## Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

### Group 5G—Water Quality Control

**THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS AND MINING OPERATIONS: AN OIL AND GAS LAWYER'S VIEW,**  
Hanna and Morton, Los Angeles, CA.  
E. S. Renwick.  
Rocky Mountain Mineral Law Institute, Vol. 23, p 975-1012 (1977).

Descriptors: \*Economic impact, \*Oil industry, \*Potable water, \*Water quality standards, Regulation, Standards, Permits, Pollution abatement, Administrative agencies, Water pollution treatment, Federal government.

The Federal Safe Drinking Water Act (SDWA) authorizes the federal Environmental Protection Agency (EPA) to establish harmful contaminant level standards applicable to all public water systems. EPA is also authorized by the SDWA to establish a joint federal-state system to ensure compliance with the standards, and to protect underground sources of drinking water. The author of this article agrees that no-one would question the desirability of safe drinking water, but he questions the necessity for the SDWA. Statistics show only 20 deaths from disease or poisoning were attributed to drinking water in the 10-year period from 1961-1970. These numbers are minute compared to many other hazards to which humans are subject. Problems which will be faced by oil and gas operators as a result of the SDWA are also identified and discussed. The author argues that the Environmental Protection Agency may not have the requisite authority to impose these new regulations on states with existing standards, and concludes that the best way to achieve SDWA goals is to develop adequate state regulations. (Stump-Florida)  
W78-11153

**THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS, AND MINING OPERATIONS: BITTERSWEET OR UNPALATABLE,**  
Saunders, Snyder, Ross and Dickerson, Denver, CO.  
J. W. Sanderson.

Rocky Mountain Mineral Law Institute, Vol. 23, p 941-974 (1977).

Descriptors: \*Oil industry, \*Economic impact, \*Water quality standards, \*Potable water, Permits, Regulation, Standards, Water pollution treatment, Pollution abatement, Administrative agencies, Water pollution control, Mining.

The real effect on oil, gas and mining operations of the Federal Safe Drinking Water Act (SDWA) will not be known for several years. However, the SDWA has created a significant amount of alarm and generated voluminous amounts of public comments. The implementation of the 1972 Federal Water Pollution Control Act (FWPCA) Amendments has produced a relatively straightforward procedural program whereby National Pollutant Discharge Elimination System (NPDES) permits are issued for all point sources of pollution. While the FWPCA generally does not protect underground waters, legislative history indicates Congress' desire to have the Environmental Protection Agency's underground injection control (UIC) programs patterned after or incorporated into the NPDES program. This article examines the UIC proposals in great detail, and attempts to predict effects on oil, gas, and mining industries. Problems created by the new legislation—not the least of which is simply adapting to the new system—are identified and discussed. The need to identify and accumulate a greater amount of data, plus built-in procedural delays, will mean a longer period from project inception to completion. However, 'tapping' existing state resources of knowledge able employees should minimize all problems. (Stump-Florida)  
W78-11154

**WATER QUALITY MANAGEMENT PLANS AND THEIR IMPACT ON MINING OPERATIONS,**  
Burlington, White, Burke and Ipsen, Denver, CO.  
H. W. Ipsen.  
Rocky Mountain Mineral Law Institute, Vol. 23, p 551-594 (1977).

Descriptors: \*Mine drainage, \*Mine wastes, \*Federal Water Pollution Control Act, \*Water quality control, Mining, Water pollution sources, Water quality, Mine water, Legislation, Regulation, Pollution abatement, Comprehensive planning.

The probable effects of current governmental planning efforts designed to achieve Federal Water Pollution Control Act (FWPCA) goals are examined in this article. Regulatory features of water quality management plans and problems concerning the implementation and enforcement of these plans, specifically in the context of mining operations, are detailed. The controls developed in the governmental plans will to some degree regulate mining operations, and may go so far as to require the elimination of mining activities in various western states where serious water quality problems already exist. Pollution from surface and underground mines was a primary source of concern which led to the enactment of Section 208 of the FWPCA; however, the Environmental Protection Agency's interpretive guidelines support the view that the main regulatory thrust of Section 208 planning should be aimed at new sources rather than existing ones. The principle means of controlling mines and other sources under Section 208 will be the development of 'best management practices' to control nonpoint sources of pollution, and combining technological and economic considerations with water quality concerns. (Stump-Florida)  
W78-11156

**ENVIRONMENTAL LAW ISSUES IN THE DEVELOPMENT OF ENERGY RESOURCES,**  
Texas Tech Univ., Lubbock. School of Law.  
For primary bibliographic entry see Field 6E.  
W78-11160

**THE DEEPWATER PORT ACT OF 1974: THE DEFINITION OF ADJACENT COASTAL STATES,**  
For primary bibliographic entry see Field 6E.  
W78-11162

**APPLICATION OF FEDERAL COMMON LAW OF PUBLIC NUISANCE TO INTRASTATE STREAM POLLUTION—COMMITTEE FOR CONSIDERATION OF JONES FALLS SEWAGE SYSTEM V. TRAIN,**  
For primary bibliographic entry see Field 6E.  
W78-11173

**FLORIDA SAFE DRINKING WATER ACT.**  
For primary bibliographic entry see Field 6E.  
W78-11178

**CONTROL, PREVENTION, AND ABATEMENT OF POLLUTION OF SURFACE WATERS.**  
For primary bibliographic entry see Field 6E.  
W78-11182

**STATE OF WASHINGTON V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (VALID EFFLUENT GUIDELINES NECESSARY FOR EPA AUTHORITY).**  
For primary bibliographic entry see Field 6E.  
W78-11185

**INLAND STEEL COMPANY V. ENVIRONMENTAL PROTECTION AGENCY (CURRENT PER-**

**MIT CAN INCLUDE CONDITION THAT SUBSEQUENTLY ADOPTED DISCHARGE STANDARDS WILL BE APPLICABLE TO DISCHARGER).**  
For primary bibliographic entry see Field 6E.  
W78-11187

**QUALITY OF IRRIGATION WATER AND SURFACE RETURN FLOWS FROM SELECTED AGRICULTURAL LANDS IN NEVADA DURING THE 1974 IRRIGATION SEASON,**  
Max C. Fleischmann Coll. of Agriculture, Reno, NV.  
For primary bibliographic entry see Field 5B.  
W78-11199

**WASTEWATER MANAGEMENT PLANNING: SOURCES OF CONFLICT IN THE EVALUATION OF ALTERNATIVES,**  
Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.  
H. E. Schwarz, and B. M. Stern.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 001, Price codes: A06 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRRC, Pub. No. 91, December 1977. 104 p, 2 tab, 2 fig, 52 ref, 4 append. OWRT A-499-MASS(1), 14-34-0001-7046.

Descriptors: Planning, Project planning, \*Alternative planning, Wastewater(Pollution), \*Non-structural alternatives, Decision making, Social aspects, \*Massachusetts, \*Water pollution control, \*Water quality standards, \*Attitudes, Conflict resolution, \*Wastewater management, 208 planning.

This study investigates one conflict in regional wastewater planning which received significant attention by laymen and professionals, the conflict between 'structural' and 'non-structural' solutions to wastewater problems. Interviews, questionnaires and secondary materials, e.g., reports, correspondence and policy papers were used to assess the problem in two study areas, the towns of Acton and Westminister. In addition to town officials and citizens, state and federal officials dealing with wastewater problems in general and the study areas in particular were interviewed, as were engineers and planners familiar with the problem. It was found: (1) that the conflict was rather between the traditional and centralized wastewater management alternatives, i.e., sewers and end-of-pipe treatment, and alternatives to that approach than between structural and non-structural measures; (2) that this conflict could exist within a town as well as between different levels of government; and (3) that the roots of conflict often lay in areas only indirectly related to wastewater management alternatives. (Lefferts-Mass)  
W78-11202

**THE EFFECTS OF ELEVATED LEVELS OF SODIUM IN COMMUNITY DRINKING WATER ON BLOOD PRESSURE DISTRIBUTION PATTERNS,**  
Massachusetts Univ., Amherst. Div. of Public Health.  
E. J. Calabrese, and R. W. Tuthill.  
Available from the National Technical Information Service, Springfield, VA 22161, Price codes: A03 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, Pub. No. 94, February 1978. 28 p, 3 tab, 1 fig, 77 ref, append. OWRT A-102-MASS(1), 14-34-0001-7046.

Descriptors: \*Sodium, \*Public health, Human diseases, \*Potable water, Water quality standards, Epidemiology, Human pathology, \*Distribution patterns, \*Hypertension, Sodium standard, Drinking water standard, Road salt, \*Massachusetts.

High school sophomores residing in a community with elevated levels of sodium in the drinking water (108 mg/l) exhibited a marked upward shift in blood pressure distribution patterns for systolic and diastolic pressure when compared with students in an appropriately matched community with low sodium levels (8 mg/l). The females exhibited a blood pressure distribution pattern characteristic of persons 10 years older while for males the upshift was similar to that of a group approximately 2 years older. The data suggest that elevated levels of sodium in drinking water may exert an adverse effect on normal healthy persons. (Lefferts-Mass)  
W78-11204

# **OIL SPILLS: THE POLICY OF PREVENTION AND THE STRATEGY OF RECOVERY**

Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.  
J.M. Conrad.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 931. Price codes: A05 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRRC Publication No. 93, October 1977. 88 p., 8 tab., 4 fig., 21 ref. OWRT A-087-MASS(1), 14-34-0001-6022.

Descriptors: \*Oil spills, \*Oil pollution, \*Pollution abatement, \*Statistical models, Planning, Non-structural alternatives, \*Stochastic processes, \*Massachusetts, Water pollution control.

A model of offshore petroleum production is constructed which contains a stochastic spill process where the amount spilled in the current period is conditional upon previous period production and other distribution parameters. The role of liability rules within the stochastic spill model is examined and an optimal liability rule derived. Existing and proposed federal legislation as well as current international conventions are discussed and their efficacy as a policy for spill prevention is evaluated. It is concluded that liability rules alone are incapable of establishing a comprehensive policy of prevention, particularly when biological and amenity resources vary along a coastline. As such there is a definite need for regulation of petroleum traffic and for greater investment in the design and deployment of recovery systems. A model for the optimal location of recovery resources is developed and applied to coastal Massachusetts. Southern Cape Cod and the islands of Martha's Vineyard and Nantucket were found to be underprotected. (Lefferts-Mass)  
W78-11205

# **WATER TREATMENT FOR SMALL PUBLIC SUPPLIES**

New Mexico State Univ., University Park. Dept. of Chemical Engineering.  
For primary bibliographic entry see Field 5F.  
W78-11208

# **BENZIMIDAZOLE FUNGICIDES IN VIRGINIA SOILS: MOVEMENT, DISAPPEARANCE, AND EFFECT ON MICROORGANISMS**

Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Plant Pathology and Physiology.  
For primary bibliographic entry see Field 5B.  
W78-11215

# **THE EFFECTS OF THE USE AND REGULATION OF SEPTIC TANK SYSTEMS UPON LAND USE IN MASSACHUSETTS**

Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning.  
J.H. Twichell.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 007. Price codes: A05 in paper copy, A01 in microfiche.

Massachusetts Water Resources Research Center, Amherst. Pub. No. 96, January 1978. 90 p., 4 fig., 14 tab., 32 ref., 3 append. OWRT A-103-MASS(1), 14-34-0001-7046.

Descriptors: \*Septic tanks, Land development, Domestic wastes, \*Land use, Non-structural alternatives, Urbanization, Zoning, \*Massachusetts, Community development, Rural areas, Suburban areas, Pollution abatement, Water pollution control, Massachusetts Environmental Code, Urban-Growth Regulation, P.L. 92-500 Section 208.

This study explores some of the land use effects associated with the use of septic tank systems in Massachusetts. Documentation was achieved by mapping certain U.S. Census data, searching the literature, and interviewing people with knowledge of the subject. Attempting to preserve a sense of community character and protect the quality of 'rural' environment, some communities have strictly enforced the Massachusetts Environmental Code as a way to limit further residential and industrial development. However, the Code is not effective as a tool to guide the use of land. While its use may tend to limit the number of new homes that are built, the requirements for large lots also force each new home to use more land. At the same time, by encouraging single-family development, which demands many public services such as schools and hospitals, to the exclusion of other land uses, it can burden a community's tax structure. Furthermore, over-reliance upon the Code as a growth inhibitor without recognizing the limitations of septic systems and their requirements for maintenance, can force a community to later install expensive sewers should large numbers of systems begin to malfunction. (Lefferts-Mass)  
W78-11216

# **RECOVERY OF SANITARY-INDICATOR BACTERIA FROM STREAMS CONTAINING ACID MINE WATER**

West Virginia Univ., Morgantown. Water Research Inst.  
For primary bibliographic entry see Field 5A.  
W78-11217

# **AQUACULTURE TECHNIQUES: WATER USE AND DISCHARGE QUALITY**

Idaho Univ., Moscow. Coll. of Fisheries, Wildlife and Range Sciences.  
G.W. Klontz, I.R. Brock, and J.A. McNair.  
Available from National Technical Information Service, Springfield, VA 22161, as PB-285 956. Price codes: A06 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, April 1978. 114p 7 fig., 22 tab., 5 append.

Descriptors: \*Idaho, \*Aquaculture, \*Fish management, Water quality control, Water pollution, Fish, Fish farming, \*Fish hatcheries, Fish handling facilities, Forecasting, Computer programs, \*Growth rates.

The objectives were to develop and test methods of predicting waste product generation from aquaculture facilities. Factors involved in waste product generation were identified. Among the 40-plus factors having the capability of affecting production in an aquaculture facility, each factor interacted with one or more other factors in a dependent or counterdependent manner. Factors chosen for testing were (1) feeding rate; (2) diet efficiency; (3) growth rate; (4) population density; (5) water replacement time; (6) oxygen consumption; (7) fish size; and (8) water temperature. Although there were other probable choices for consideration, these eight were chosen with the other factors being dependent functions. Significant results are: (1) The identification of factors not only involved with the generation of waste products from an aquaculture facility, but also having the potential of affecting the production of an aquaculture facility. (2) The development of a

practical method for determining oxygen consumption of fish in varying controlled environmental conditions. (3) The development of a computerized program for fish growth in optimized loading conditions of population density and water replacement time. (4) The development of a method to predict more accurately the anticipated growth rate of a group of fish, which corrects the existing method. (5) The development of a method to predict the solids, both settleable and suspended, produced daily by a group of fish being held in known conditions.  
W78-11219

# **A CRITICAL TECHNICAL REVIEW OF SIX ADDITIONAL HAZARD ASSESSMENT MODELS**

Enviro Control, Inc., Rockville, MD.  
For primary bibliographic entry see Field 5B.  
W78-11224

# **DETAILED BATHYMETRY OF SELECTED AREAS OF THE INNER CONTINENTAL SHELF OF THE VIRGINIAN SEA: SOUTHEASTERN VIRGINIA, VIRGINIA BEACH AND VACHAPREAGUE, VIRGINIA**

Virginia Inst., of Marine Science, Gloucester Point.  
For primary bibliographic entry see Field 2L.  
W78-11225

# **HYDROGRAPHY OF OREGON ESTUARIES PRIOR TO JUNE 1956**

Oregon State Coll., Corvallis. School of Science.  
For primary bibliographic entry see Field 2L.  
W78-11226

# **BRUNSWICK ESTUARY STUDY.**

Georgia Dept. of Natural Resources Atlanta. Environmental Protection Div.  
For primary bibliographic entry see Field 2L.  
W78-11227

# **MARINE PASTURES: A BY-PRODUCT OF LARGE (100 MEGAWATT OR LARGER) FLOATING OCEAN THERMAL POWER PLANTS**

Lamont-Doherty Geological Observatory, Palisades, NY.  
O.A. Roels.  
Available from the National Technical Information Service, Springfield, VA 22161 as COO-2581-2. Price codes: A11 in paper copy, A01 in microfiche. Progress Report COO-2581-2, for the Period Feb. 1, 1976 to April 30, 1976, to U.S. Energy Research and Development Administration. 37 p. E(11-1)2581.

Descriptors: \*Resources development, \*Computer programs, \*Powerplants, Baseline studies, Water quality, \*Outer Continental Shelf, \*Ocean thermal powerplants, \*Floating powerplants, Chaetoceros, Tapes semidecussata.

Computer programs have been developed to define the temperature increase which would be needed to bring deep-ocean water into density equilibrium with surface water for locations where data are available. A series of continuous-flow studies on phytoplankton blooms resulting from mixtures of deep and surface water in 2000-liter concrete culturing vessels ('reactors') has been completed. Preliminary results indicate that in approximately half of these mixtures (those dominated by various species of Chaetoceros) blooms reached peak productivity within three days and could be maintained on continuous flow for an average of 40 days at one volume turnover per day. Almost complete uptake of dissolved inorganic nitrogen under these conditions has been obtained. A quantitative determination of nutrient utilization and flow through a combined primary and secondary trophic level system has been

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completed. This study utilized the clam *Tapes semidecussata*, fed from phytoplankton grown in deep and surface water. Preliminary results indicate that for 140 g of animals in a 4-liter tray, fed at a rate of 1 ml/sec, over 45 fathoms of the dissolved inorganic nutrients in the deep and surface water mixture are converted into *Tapes* meat-nitrogen. (Sinha-OEIS)  
W78-11228

**EXCHANGE OF MANGANESE, IRON, COPPER, AND ZINC BETWEEN DISSOLVED AND PARTICULATE FORMS IN THE NEWPORT RIVER ESTUARY, NORTH CAROLINA,**  
Oregon State Univ., Corvallis. School of Oceanography.

For primary bibliographic entry see Field 5B.  
W78-11230

**A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOLUME IX, THE COMPUTER PROGRAM,**  
Rand Corp., Santa Monica, CA.  
For primary bibliographic entry see Field 5B.  
W78-11231

**SOCIOECONOMIC IMPACTS OF OUTER CONTINENTAL SHELF OIL AND GAS DEVELOPMENT-A BIBLIOGRAPHY,**  
Geological Survey, Reston, VA.  
For primary bibliographic entry see Field 6G.  
W78-11232

**INTERIM HIERARCHICAL REGIONAL CLASSIFICATION SCHEME FOR COASTAL ECOSYSTEMS OF THE UNITED STATES AND ITS TERRITORIES,**  
Fish and Wildlife Service Fort Collins, CO.  
For primary bibliographic entry see Field 2L.  
W78-11233

**A CASE HISTORY OF PORT MANSFIELD CHANNEL, TEXAS,**  
Coastal Engineering Research Center, Fort Belvoir, VA.  
For primary bibliographic entry see Field 8B.  
W78-11235

**LABORATORY INVESTIGATION OF TIDAL INLETS ON SANDY COASTS,**  
California Univ. Berkeley. Hydraulic Engineering Lab.  
For primary bibliographic entry see Field 8B.  
W78-11236

**PROBLEMS IN ATTEMPTING TO TRANSLATE STATUTORY STANDARDS INTO EMISSION LIMITATIONS UNDER AIR AND WATER POLLUTION CONTROL LEGISLATION,**  
Yeshiva Univ., New York. School of Law.  
J. L. F. Silver.  
Villanova Law Review, Vol. 22, No. 6, p 1122-1170 (October, 1977).

Descriptors: \*Water Quality Act, \*Federal Water Pollution Control Act, \*Regulation, \*Water pollution control, Effluents, Water pollution treatment, Legislation, Legal aspects, Water law, Water quality control, Standards.

In an effort to understand why many pollution control efforts appear unsuccessful, this article explores various statutory standards' implementation problems. The author also suggests reforms which could result in a better environmental quality. Attention is focused on the coast of these environmental quality reforms, so that the nation may decide if it is willing to pay the necessary price. In the author's view, the 1972 amendments to the 1965 Water Quality Act. In conjunction with

the present Federal Water Pollution Control Act, are the most important pieces of legislation now affecting water quality regulation in the United States. For the first time under any water pollution legislation, direct control over effluent limitations is centralized in the federal government with the limitations to be developed on the basis of plant categories (for example, petroleum refineries, rubber processing, textile mills, etc.). The establishment of these effluent limitations is to be based primarily on the pragmatic consideration of what can be done, relegating the standards that should be achieved to a secondary, albeit important, position. (Stump-Florida)  
W78-11240

**SUMMARY, NEW HAMPSHIRE WATER QUALITY STANDARDS.**  
New Hampshire Water Supply and Pollution Control Commission, Concord.  
July, 1977, 13 p, 1 fig, 1 tab.

Descriptors: \*Federal Water Pollution Control Act, \*Water quality control, \*Water quality standards, \*New Hampshire, Water policy, Water utilization, Surface waters, Water permits, Water management (Applied), Standards, Water resources, Management.

This official state document is an updated and condensed version of the 1971 publication entitled 'State of New Hampshire Water Quality Standards Summary'. It is a periodic review of the state's water quality standards mandated by the 1972 Federal Water Pollution Control Act Amendments. Definitions of water use classifications, which are divided into three water quality levels, are included. These levels are determinations of ultimately desired water uses, rather than statements of current water quality. A map illustrating the classification of surface waters is also included. The criteria for determining water quality are explained and a table presents the parameters and associated standards currently used in New Hampshire for water quality assessment. The anti-degradation policy of the state Water Supply and Pollution Control Commission is also explained; definitions of pertinent terms are included. State policy is aimed at protecting waters which are currently of high quality, and prohibits any uses which would become injurious to existing uses. For a more detailed treatment of any included information, the Water Supply and Pollution Control Commission should be consulted. (Stump-Florida)  
W78-11241

**THE DEVELOPMENT OF AN INTEGRATED SYSTEM FOR WATER QUALITY MANAGEMENT PLANNING,**  
Connecticut Univ., Storrs.  
J. E. Sarsenski.  
Available from University Microfilms International, Ann Arbor, MI 48106; Order No. 7806147.  
PhD Thesis, 1978, 229 p.

Descriptors: \*Model studies, \*Water quality control, \*Water utilization, \*Land use, \*Treatment facilities, Mathematical models, Sewerage, Interceptor sewers, Population, Land management, Planning, Waste water treatment, City planning.

Integrated models were designed to incorporate population and land use patterns, water quality criteria, waste treatment systems, and associated costs into water quality management system design. An epicenter model plotted as an ogee curve described the population density patterns and residential, commercial, and industrial land use relationships. The GENERATE model calculated waste water flows associated with the land use patterns. Residential flow was based on population density and per capita flow; commercial flow was dependent upon acreage and per acre flow coefficients; and industrial flow was taken from standard published data. A sewer model developed alternative interceptor designs which

considered maximum waste loads and water quality standards. The results of the sewer model were incorporated into a treatment planning and cost model which calculated the land area requirements and associated costs of various treatment configurations. By varying the water quality parameters, the tradeoffs of specific water uses and treatment system costs were assessed. Planning tools to evaluate interrelationships between the various areas of water quality management were considered limited by the lack of an adequate data base. (FIRL-Lisk)  
W78-11242

**INTERIOR'S FAILURE TO COMPLY WITH NEPA BLOCKS ATLANTIC OCS OIL LEASING.**  
For primary bibliographic entry see Field 6E.  
W78-11246

**RESERVE MINING: AN EPIC BATTLE DRAWS TO A CLOSE.**  
Environmental Science and Technology, Vol. 11, No. 10, p 948-950 (October, 1977).

Descriptors: \*Minnesota, \*Waste disposal, \*Industrial wastes, \*Lake Superior, Water pollution sources, Water quality, Social impact, Judicial decisions, Economic justification, Project feasibility, Silicates, Impoundments.

The Reserve Mining Company has discharged silica waste tailings into Lake Superior since 1955. This poses a health problem since the tailings contain asbestiform fibers. These fibers are carcinogenic when inhaled. Their effects when ingested as a result of their presence in the drinking water of several cities is not yet known. The Mining Company has fought legal battles with environmentalists, and state and federal agencies since 1971. Problems concerning the economic feasibility of permit requirements and the economic impact of losing the company's 3000 jobs have complicated what would have otherwise been a more simple case of environmental standards violations. As the legal battles were drawing to a close, the Company had been ordered to take immediate steps to curb its air pollution. Discharge of the tailings into Lake Superior will be allowed until 1980, pending the Company's completion of an on-land disposal basin. The tailings basin is to be operated as a closed system, monitored by routine air and water monitoring programs. Tailings particles are to be submerged under water, and all exposed tailings are to be vegetated. (Baumbach-Florida)  
W78-11248

**GUIDELINES FOR PREPARATION OF WATER QUALITY MANAGEMENT PLANS.**  
Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 444. Price codes: A04 in paper copy, A01 in microfiche. September, 1974, 67 p.

Descriptors: \*Federal Water Pollution Control Act, \*Water quality control, \*Comprehensive planning, \*Water management (Applied), \*River basin development, Legislation, Water pollution control, Water quality standards, Water policy, River basin commissions, Water pollution effects, Administration, Management, Planning, Coordination, River basins, Administrative agencies, Governmental interrelations, Federal government, State governments.

Section 303(e) of the Federal Water Pollution Control Act Amendments of 1972 provide for the establishment and implementation of 'basin plans', in order for states to coordinate their water quality decisions on a river basin scale. The Environmental Protection Agency (EPA) has established guidelines for the preparation of basin plans which are presented in this report. The pur-



pose of the plans is to identify and implement measures to correct a river basin's water quality problems. To accomplish this, basin planning must reflect the objectives of facilities planning and waste treatment management planning for the area in which they are located. However, as opposed to these plans, the basin plan is designed to be a dynamic management tool, rather than a static compilation of data and material. Basin plans should include the following elements: (1) a ranking of significant dischargers; (2) a schedule of compliance; (3) an assessment of municipal needs; (4) a determination of maximum daily pollutant loads; (5) load allocations and effluent limitations; (6) an assessment of nonpoint sources of pollution; (7) residual waste controls; (8) proposed revisions of water quality standards; (9) planning relationships; (10) monitoring and surveillance programs; and (11) interstate and intergovernmental cooperation. The level of detail for each of these elements should be agreed upon by the particular state and the EPA. (Malesatto-Florida) W78-11249

**CONSERVATION DISTRICTS AND 208 WATER QUALITY MANAGEMENT, NON-POINT SOURCE IDENTIFICATION AND ASSESSMENT; SELECTION OF BEST MANAGEMENT PRACTICES; MANAGEMENT AGENCIES; REGULATORY PROGRAMS,**

National Association of Conservation Districts, Washington, DC.  
W. B. Davey.  
Available from the National Technical Information Service, as PB-274 411. Price codes: A16 in paper copy, A01 in microfiche. Report to Environmental Protection Agency, Water Planning division, Washington, DC. Publication WH-544, (June 1977), 175 p, 6 fig, 18 tab.

Descriptors: \*Water conservation, \*Water quality control, \*Water quality control, \*Water quality standards, \*Pollution abatement, Federal Water Pollution Control Act, Regulation, Water pollution sources, Water pollution control, Salts, Comprehensive planning, Wastes, Water districts.

This publication shows the potential conservation district involvement in the preparation and implementation of state and areawide water quality management plans developed pursuant to Section 208 of the 1972 Federal Water Pollution Control Act Amendments. The publication emphasizes the non-point pollution source aspects of erosion and sediment control, animal waste management (organics), and irrigation water management (salts), but other information is included concerning the preparation of management plans which the federal Environmental Protection Agency indicates should be directed to meet two principal mandates of the Act: (1) the determination of effluent limitations needed to meet areawide management programs to implement abatement measures for all pollutant sources (Section 208). The information in this publication describes conservation district capabilities and their potential participation in water quality management planning and implementation. In states where plans are relatively well advanced, with work complete or underway beyond the scope of this document, no 'back up' or 'redirection' should be implied or construed. The suggestions in this publication often reflect experiences of planning agencies or conservation districts in such areas. (Beamer-Florida) W78-11251

**NITRATE-NITROGEN REMOVAL FROM SOIL PROFILES BY ALFALFA,**  
Southwestern Great Plains Research Center, Bushland, TX.  
For primary bibliographic entry see Field 5B. W78-11277

**CONVERT CITY SEWAGE TO FARM FERTILIZER.**  
Wallaces Farmer, V. 102, No. 17, p 181, Sept. 10, 1977.

Descriptors: \*Sewage sludge, Fertilizers, Heavy metals, Crop response, \*Water pollution control, \*Land application, Disease organisms, \*Groundwater pollution, Runoff control, Composting.

Converting municipal sewage sludge to fertilizer to help dispose of this waste hasn't progressed as some people felt it would. One of the largest obstacles has been the heavy metal components of sewage which are dangerous to both plants and animals. Disease threat from the sludge has been another hazard. However, tests conducted by Edward Clapp of the USDA Agricultural Research Service, have indicated fertilization by such sludge is quite promising. Annual application of 4.5 tons of sludge per acre resulted in yields of 108 bu. of corn per acre, and 4.3 tons of reed canarygrass per acre. Control areas receiving conventional fertilizer yielded 102 bu. of corn per acre and 3.4 tons of reed canarygrass. Analyses revealed no difference in the heavy metal content of the corn grain or leaf tissue from sludge areas as a conventionally fertilized plot. Concentration of heavy metals in soil water was not increased by sludge application, and analysis of surface and groundwater showed no movement of potentially polluting materials out of the watershed. Results seem to indicate that this type of sludge may be used safely for agricultural purposes if the land is properly terraced for runoff control. Scientists are also developing composts for utilizing sewage sludge. Such compost would foster water retention, help prevent leaching of nutrients, and would raise the potassium level of the soil. (Merryman-East Central) W78-11281

**OPPORTUNITIES FOR MORE EFFECTIVE USE OF ANIMAL WASTES,**  
General Accounting Office, Washington, DC.  
E. B. Staats.  
General Accounting Office Report 76-101, June 14, 1976, 40 p.

Descriptors: \*Waste disposal, Recycling, Confinement pens, Livestock, Technology, Economics, Farm wastes, \*Land disposal, Pyrolysis, Ammonia synthesis gas, Feedlots.

EPA's animal waste research program has been concentrated on the land application of the manure both as fertilizer and as a means of disposal. Although EPA has recognized the existence of various potential alternatives to land application, it has expended only minimal effort in developing these alternatives through small grants for laboratory research. An EPA official responsible for the Animal Feedlot Waste Research Program told us (the General Accounting Office) that EPA funded projects for ammonia synthesis gas production and production of useful products through pyrolysis were both at a stage where pilot plants have become necessary to test on a larger scale the results achieved in the laboratory. However, EPA officials said that EPA does not plan to proceed further with these methods. As discussed in chapter 2, our review identified several confinement operations, particularly holding pens for several meat packing plants which, because of their location in an urban area, were unable to dispose of accumulated manure to farmers for use as fertilizer. For these operations and for the large feedlots which may have disposal problems when operating at full capacity (currently operating nationally at about 50 percent) the various experimental technologies for manure use represent potential methods of solving the disposal problem. We believe that more research effort should be directed toward bringing such technologies to a commercially acceptable level of development including the determination of economic feasibility

of the various alternatives. Of particular importance is the development and acceptability of those technologies, such as ammonia synthesis, which have shown promise in the laboratory but must now be tested on a larger scale to prove their practical commercial value. The General Accounting Office recommends that the Administrators of the Environmental Protection Agency and the Energy Research and Development Administration and the Secretary, Department of Agriculture enter into a joint agreement delineating responsibilities for the disposal and utilization of animal manure and provide for adequate coordination of activities. This agreement should provide assurance that innovative research projects, such as those discussed in this report, will be given adequate consideration for development to a stage where the economic and technical viability of the technology can be determined. (East Central) W78-11284

**ENGINEER EXPLAINS NEW WASTE RUNOFF SYSTEM.**  
Feedstuffs, V. 49, No. 16, p 15, April 18, 1977. 1 fig.

Descriptors: \*Feedlots, \*Agricultural runoff, \*Water pollution control, Separation techniques, Costs, Biological treatment, Labor, Settling, Serpentine grassed waterway.

University of Nebraska agricultural engineer E. A. Alson reported on a new method of draining feedlots to comply with pollution standards at a meeting of the Mid-Central branch of the American Society of Agricultural Engineers held in St. Joseph, Missouri. The new system uses the serpentine or switch-back design with a grassed waterway to handle runoff from open lots. The runoff is passed through 2 wire screen debris traps to collect solids. The liquid then passes to a holding pond where it can be drained through the switchback system at periodic intervals. The solids load on the system is reduced by mechanical scraping of the lots. The system promises to be less costly to construct and will require less labor to operate than systems that require pumping or hauling liquids to the fields. (Merryman-East Central) W78-11296

**PROJECTS IN PROGRESS. SOME FEEDLOT INS AND OUTS,**  
Utah Agricultural Experiment Station, Logan.  
L. M. Cox.  
Utah Science, V. 38, No. 3, p 91-92, Sept., 1977.

Descriptors: \*Water pollution sources, Utah, \*Feedlots, \*Agricultural runoff, Computer models, Overland flow.

Dennis George and Dan Filip (Utah Water Research Laboratory) in conjunction with William Grenney and James Reynolds, have just completed the first year of research designed to determine if small feedlots clustering in river basins are polluting local streams. After simultaneously monitoring a network of small streams that drains into the Little Bear River and several feedlots in a different part of the Little Bear River Basin, the team (which includes graduate student Steve Wieneke and a number of well qualified technicians), is ready to start inserting data into a computer model of the limited network of streams. Later the Basin's entire stream system will be modeled. These models should facilitate valid projections of future water pollution events, and should be readily applicable to comparable river basins. The models will also indicate the pollution-processing capabilities of specific streams in wet, dry, and normal years. An accompanying study is to be conducted in Cache Valley in which a minimum of 2 feedlots will be used as test sites for a 'greenbelt' or overland-flow approach to treating livestock wastes. In each case, the animals will be fed in an area removed from the stream and the

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animals will have no direct access to the water. Grass will be established between the area where the animals are to be held and the stream. This grass should effectively pre-filter any potential stream pollutants. (Merryman-East Central) W78-11298

## 6. WATER RESOURCES PLANNING

### 6A. Techniques Of Planning

**POLICY ANALYSIS THROUGH CARRYING CAPACITY,**  
Ottawa Univ. (Ontario). Dept of Geography and Regional Planning.  
P. F. Ricci.

Journal of Environmental Management, Vol 6, No 1, p 85-97, January 1978. 5 fig, 22 ref.

Descriptors: \*Environmental control, \*Carrying capacity, \*Policy analysis, Decision making, Control theory, Operational definition, Qualitative analysis, Canada, Freshwater, Water budget, Population dynamics, Simulation analysis, Ecology, Anthropology, Natural environment, Human environment, Management, Mathematical models, Equations, Systems analysis.

Traditional views of carrying capacity are found to be conceptually appealing and transferable to policy-analysis if the asymptotic implication of the phrase is understood. To overcome the inherent rigidity of the phrase, it is suggested that the concept be operationalized, without recourse to a definition, as a heuristic model for policy analysis. The objective of the operational definition is to provide prescriptive applicability in which carrying capacity, although loosening the precision inherent to its scientific nature, maintains the accuracy necessary to policy analysis. In reviewing the concept, examples are used, including the fresh water water budget of Canada and problems of population dynamics. The approach suggested to operationalize the concept is based on control theory, as a possible approach to enhance the qualitative understanding of the cause-and-effect of a policy. (Bell-Cornell) W78-10651

**A COMPREHENSIVE METHODOLOGY FOR ASSESSING ENVIRONMENTAL IMPACT,**  
British Columbia Univ., Vancouver. Dept of Soil Science.  
For primary bibliographic entry see Field 6G. W78-10652

**ECONOMICS OF MULTIPLE-USE FORESTRY,**  
Victoria Univ. (British Columbia).  
For primary bibliographic entry see Field 6B. W78-10654

**LARGE-SCALE PLANNING PROJECTS: THE TENNESSEE VALLEY AUTHORITY AND THE BRATSK-ILIMSK COMPLEX,**  
International Inst. for Applied Systems Analysis, Laxenburg (Austria).  
For primary bibliographic entry see Field 6B. W78-10655

**METHODOLOGY AND EMPIRICAL ESTIMATES OF THE RESPONSE FUNCTION OF SORGHUM TO IRRIGATION AND SOIL MOISTURE,**  
Volcani Inst. of Agricultural Research, Bet-Dagan (Israel). Inst. of Soil and Water.  
For primary bibliographic entry see Field 3F. W78-10659

**A PARTITIONING PROCEDURE FOR WATER QUALITY MANAGEMENT MODELS,**  
Environmental Protection Agency, Cincinnati, OH.  
For primary bibliographic entry see Field 5G. W78-10660

**A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,**  
Instituto Venezolano de Investigaciones Cientificas, Caracas. Lab. de Ingenieria Ambiental.  
For primary bibliographic entry see Field 5G. W78-10661

**AN APPROXIMATE METHOD FOR SIZING DETENTION RESERVOIRS,**  
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 4A. W78-10662

**FINAL REPORT, ENVIRONMENTAL IMPACT MODEL DEVELOPMENT FOR NAVAL OPERATIONS,**  
Naval Weapons Center, China Lake, CA. Public Works Dept.  
For primary bibliographic entry see Field 6G. W78-10667

**MULTILEVEL APPROACH TO URBAN WATER RESOURCES SYSTEM ANALYSIS - APPLICATION TO MEDIUM SIZE COMMUNITIES: URBAN STORM-DRAINAGE SYSTEMS PLANNING,**  
Purdue Univ., Lafayette, IN. Water Resources Research Center.  
S. A. Dendrou, J. J. Talavage, and J. W. Delleur.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 698, Price codes: A08 in paper copy, A01 in microfiche. Technical Report No. 101, May 1978. 155 p, 35 fig, 10 tab, 6 append. OWRT-B-083-IND(4).

Descriptors: \*Urban drainage, \*City planning, \*Methodology, Urban runoff, \*Storm runoff, Land use, \*Urbanization, \*Model studies, \*Urban growth, Growth rates(Population), \*Storm-drainage model, STORM, LANDSTORM, LANDUSE, URBDRRAIN.

The relationship between urban growth and the storm drainage problem is analysed. A multilevel coordinated approach is used in a simulation-based optimization scheme that determines, at the planning level of details, the storm water system best suited for given trend of urban growth. Similar models dealing with water supply and sanitary sewer problems would allow for a global analysis of relationships between urban growth and water resources. The simulation phase of the storm drainage planning model is provided by the module LANDSTORM, which is a combination of (1) the land use forecasting model LANDUSE (presented in Purdue University Water Resources Research Center Technical Report No. 100 (See W78-07781), (2) a modified version of the urban hydrologic model STORM developed by the U.S. Corps of Engineers and (3) their interface. An urban agglomeration is understood to be partitioned in several drainage basins. For each urban growth scenario of LANDUSE, STORM produces a corresponding performance of the local basin storm drainage system. The requirements of the subbasins composing the urban agglomeration are then 'coordinated' in the model URBDRRAIN to produce a globally optimal storm water system for a given growth pattern. W78-10658

**MATHEMATICAL MODELING OF A SOCIOLOGICAL AND HYDROLOGIC DECISION SYSTEM,**  
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.  
W. H. Andrews, J. P. Riley, and M. B. Masteller.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 803, Price codes: A09 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Logan. Water Resources Planning Series Report P-78-004, June 1978. 184 p, 44 fig, 28 tab, 8 append. ISSR Research Monograph No. 7. OWRT C-5177(4207)(1), 14-31-0001-3712 and 9053.

Descriptors: Sociological decisions, Hydrologic aspects, Urbanized areas, \*Model studies, \*Decision making, \*Mathematical models, Conceptual models, Planning, \*Flood control, Regression analysis, \*Simulation analysis, Social aspects, Systems approach, Land use, Evaluation.

The general goal was to develop a functional model of the sociological and related hydrologic elements in flood control decision-making. Conceptual system models were developed for the hydrologic system and for the sociological system. The sociological variables were identified as they related to the steps in the process of the model. Following the conceptual decision process model the social elements of the model were calibrated from data obtained from field studies and mathematical equations were developed and tested. Finally simulations of the process were run. After adjustments were made the model was found to function. Several methodological factors were devised to make the model more realistic and operable. These were: (1) distortion factors, (2) importance factors, (3) acceptance functions, (4) expansion effect, and (5) threshold levels. These concepts permit the model to adjust to changes in social behavior related to the social structure of the decision process. The system provides for the function of social values as they relate to the social structures and the hydrologic components. W78-11061

**A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, VOLUME 8,**  
Office of Water Research and Technology, Washington, DC.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 914, Price codes: A17 in paper copy, A01 in microfiche. Water Resources Scientific Information Center, Report OWRT/WSIC 78-201, May 1978. 388 p. Edited by Daniel P. Loucks, Cornell University, Ithaca, New York.

Descriptors: \*Systems analysis, \*Bibliographies, \*Water resources systems, \*Optimization, \*Simulation analysis, Operations research, Abstracts, \*Alternative planning, \*Management, Evaluation.

This is an annotated bibliography of 399 selected publications issued in 1975 and 1976 pertaining to the application of systems analysis techniques for defining and evaluating alternative solutions to water resource problems. The first two volumes of this bibliography, having the same title, were published by the Cornell University Water Resources and Marine Sciences Center, Ithaca, New York (Publication 25, August 1969; Publication 35, June 1971). (See W71-09465 and W70-00506). The third, fourth, fifth, sixth, and seventh volumes were published by the Water Resources Scientific Information Center in December 1972, December 1973, July 1974, September 1975, and November 1976, respectively. (See also W77-03967; W76-01517; W74-11574; W74-05401; and W73-07428). Both subject and author indexes are provided. Descriptors are listed with each abstract. The abstracted material emphasizes the application of optimization and simulation techniques for assisting in the planning and management of water resource systems.

W78-11207

**6B. Evaluation Process**

**A SURVEY OF POTENTIAL METHODS FOR RESOURCE RECOVERY FROM BLACK WATER OF THE UPPER GREEN RIVER BASIN,**  
Wyoming Univ., Laramie. Dept. of Mineral Engineering; and Wyoming Univ., Laramie. Graduate School.

For primary bibliographic entry see Field 3E.  
W78-10534

**FRESHWATER ARTIFICIAL REEFS: BIOLOGY AND ECONOMICS,**  
Virginia Cooperative Fishery Research Unit.  
E. D. Prince, and O. E. Maughan.  
Fisheries, Vol. 3(1), 1978, p 5-9, 1 tab, 3 fig, 24 ref.

Descriptors: \*Lakes, Ponds, \*Reefs, \*Recreation, Recreation demand, Recreation facilities, \*Freshwater fish, \*Sport fish, Sport fishing, Fish attractants, Fish behavior, Fish establishment, Fish harvest, Fish management, Economics, \*Artificial reefs.

Artificial reefs, either in freshwater or saltwater areas, are used to stimulate recreational fishing when lack of underwater structures has been identified as a potentially limiting factor for fishery. The productivity of artificial reefs has been demonstrated. Research and practical experience indicates that artificial reefs used in structure-deficient lacustrine environments are a biologically and economically viable fisheries management tool. (EIS-Katz)  
W78-10554

**POLICY ANALYSIS THROUGH CARRYING CAPACITY,**  
Ottawa Univ. (Ontario). Dept. of Geography and Regional Planning.  
For primary bibliographic entry see Field 6A.  
W78-10651

**ECONOMICS OF MULTIPLE-USE FORESTRY,**  
Victoria Univ. (British Columbia).  
G. R. Walter.  
Journal of Environmental Management, Vol 5, No 4, p 345-356, October 1977. 3 fig, 11 ref.

Descriptors: \*Economics, \*Forestry, \*Resources, \*Evaluation, \*Watersheds(Basins), \*Multiple use, Management, Institutions, Demand, Supply, Linear programming, Optimization, Constraints, Opportunity costs, Benefit maximization, Market failure, Systems analysis.

The forest produces a number of goods and services for which there exists a strong demand. Unlike the vast array of goods produced by the economy, private market mechanisms have failed to solve the allocation problem with regard to multiple-use services. Among the reasons underlying this failure are: historical precedence, common property problems, joint products, and lack of clear liability rules. In addressing the problem, three levels of multiple use should be identified: regional, forest, and micro-land use. Watershed management is the level at which the professional forester is most involved. A small river watershed may be managed to meet a number of needs: water, timber, forage, and recreation. The simple analytics of multiple-use watershed management are often considered in terms of production possibilities curves. The demand for forest services can be dichotomized into specific and generalized demand, while supply is a matter of opportunity costs. What ever the pattern of demand, multiple-use valuation is as much a matter of institutional form as economic method. Among the methods which may be used within a given institutional

framework are dollar value reference points, opportunity costs, shadow prices, linear programming, interagency bargaining, and artificial markets. (Bell-Cornell)  
W78-10654

**LARGE-SCALE PLANNING PROJECTS: THE TENNESSEE VALLEY AUTHORITY AND THE BRATSK-ILIMSK COMPLEX,**  
International Inst. for Applied Systems Analysis, Laxenburg (Austria).  
H. Knop.  
In: IIASA Conference '76, 10-13 May, 1976, Volume 1, p 187-202. International Institute for Applied Systems Analysis, Austria, 1976. 10 fig, 2 ref.

Descriptors: \*Comprehensive planning, \*Projects, \*Tennessee Valley Authority, \*Systems analysis, \*Regional analysis, \*Decision making, Water resources, Socio-economic systems, Management, Mathematical models, Simulation analysis, Optimization, Soviet Union, Agriculture, Industrial development.

The IIASA project on Planning and Management of Large Organizations had as its objective the systems analysis of decision-making processes in socio-economic systems. The Large Organizations group focused on case studies of large-scale planning projects embracing the interaction of socio-economic systems and their management. The first stage of research asked: How is systems analysis used as a tool of management. To answer, methodological experience in planning was drawn from, in particular, two case studies: (1) The Tennessee Valley Authority in the United States (TVA); and (2) the Bratsk-Ilimsk Territorial Production complex in the Soviet Union (BITPC). These case studies are discussed in terms of project goals, achievements, their advantages and drawbacks, and the decision-making processes and modeling techniques utilized. Two more questions were asked: (1) Who decides, and (2) How are decisions substantiated. Three aspects of the balances, models, and model systems used by the TVA and BITPC are considered: the mathematical type of models and their stage of development, sophistication, and complexity; the economic categories described in the balances and models; and the degree of comprehensiveness of models related to the national economy or its sectors. Main TVA goals were flood control, development of navigation systems, and modernization of agriculture; principal BITPC goals included the development of water-power generation by using the inexhaustible water supply in eastern Siberia. Comparisons are drawn between the two projects, and potential case studies for the future are mentioned. (Bell-Cornell)  
W78-10655

**IMPROVING IRRIGATION RETURN FLOW QUALITY WITH A WATER RENTAL MARKET,**  
Colorado State Univ., Fort Collins. Dept. of Economics.  
For primary bibliographic entry see Field 5G.  
W78-10658

**SALINITY MANAGEMENT OPTIONS FOR THE COLORADO RIVER, DAMAGE ESTIMATES AND CONTROL PROGRAM IMPACTS,**  
Utah Water Research Lab., Logan.  
For primary bibliographic entry see Field 5G.  
W78-10735

**DEVELOPING A WATER RESOURCE PLAN FOR SOUTH FLORIDA,**  
South Florida Water Management District, Tampa.  
P. B. Rhoads.  
Florida Environmental and Urban Issues, Vol. 5, No. 4, p 11-15 (April 1978).

Descriptors: \*Florida, \*Planning, \*Water resources development, \*Environmental effects, Water resources, Water supply, Mathematical models, Land use, Coordination, Population, Management, Aquifer management.

The Florida Water Resources Act of 1972 defines the state's commitment to water resource planning and provides the basis planning goals. The author discusses the planning strategy of the South Florida Water Management District (SFWMD) for the development of a water resource plan for South Florida. The strategy required a unique approach due to the substantial water management system already in existence, substantial prior planning conducted by the Army Corps of Engineers, and water resources and supply plans previously authorized by Congress. Central to the SFWMD's planning strategy are commitment to: utilization of mathematical models to manage complex water resources systems; coordination of water resource and land use planning; utilization of local government projections of population and land use trends; and consideration of environmental consequences as part of the decision making process. Summarized are specific alternatives for providing additional water supplies evaluated in the SFWMD Draft Water Use and Supply Development Plan, including: water conservation and regulations; wellfield development and aquifer management; backpumping lower east coast canals; increased Lake Okechobee storage; and advanced alternatives. The author concludes with a discussion of the SFWMD public participation program and future directions. (Hooftman-Florida)  
W78-10770

**REVIEW OF EXISTING STATE LAND USE REGULATION IN FLORIDA--AN OVERVIEW,**  
Florida Law Revision Council, Tallahassee. Office of Statutory Revision.  
For primary bibliographic entry see Field 6E.  
W78-10802

**INSTITUTIONAL ARRANGEMENTS FOR EFFECTIVE GROUNDWATER MANAGEMENT TO HALT LAND SUBSIDENCE,**  
Texas A and M Univ., College Station. Dept. of Animal Science.  
For primary bibliographic entry see Field 4B.  
W78-11057

**MATHEMATICAL MODELING OF A SOCIOLOGICAL AND HYDROLOGIC DECISION SYSTEM,**  
Utah State Univ., Logan. Inst. for Social Science Research on Natural Resources.  
For primary bibliographic entry see Field 6A.  
W78-11061

**ASSESSING THE SOCIAL EFFECTS OF WATER QUALITY MANAGEMENT PROGRAMS,**  
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.  
For primary bibliographic entry see Field 5G.  
W78-11062

**THE PUBLIC INTEREST IN WATER RIGHTS ADMINISTRATION,**  
California State Dept. of Water Resources, Sacramento.  
For primary bibliographic entry see Field 6E.  
W78-11155

**POLICY AND PROGRAM ANALYSIS OF AN OPEN LAND APPROACH TO FLOOD PLAIN MANAGEMENT,**  
Cornell Univ., Ithaca, NY. Center for Environmental Research.  
For primary bibliographic entry see Field 6F.  
W78-11201



## Field 6—WATER RESOURCES PLANNING

### Group 6B—Evaluation Process

**WASTEWATER MANAGEMENT PLANNING: SOURCES OF CONFLICT IN THE EVALUATION OF ALTERNATIVES,** Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.  
For primary bibliographic entry see Field 5G.  
W78-11202

**OIL SPILLS: THE POLICY OF PREVENTION AND THE STRATEGY OF RECOVERY,** Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.  
For primary bibliographic entry see Field 5G.  
W78-11205

**A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, VOLUME 8,** Office of Water Research and Technology, Washington, DC.  
For primary bibliographic entry see Field 6A.  
W78-11207

**THE IMPACT OF ENERGY RESOURCE DEVELOPMENT ON WATER RESOURCE ALLOCATIONS,** Utah Water Research Lab., Logan.  
J. E. Keith, K. S. Turna, S. Padunchai, and R. Narayanan.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 135.  
Price codes: A06 in paper copy, A01 in microfiche.  
Water Resources Planning Series, Report P-78-005, June 1978. 95 p., 6 fig., 58 tab., append. OWRT B-131-UTAH(1), 14-34-0001-6125.

**Descriptors:** \*Linear programming, \*Energy development, \*Water allocation, \*Agricultural requirements, \*Utah, Water requirements, Model studies, Irrigation water, Competing uses, Projections, Future planning, \*Economic impact, \*Colorado River Basin(Utah).

A linear programming model of the agricultural and energy sectors of Utah was used to examine the economically efficient allocation of water between agriculture and energy. Data were collected for agricultural returns, costs, and water requirements; energy returns, costs, and water requirements; and water supply costs. Results indicate that if large scale energy development occurs in the Colorado River Basin in Utah, most of irrigated agriculture will be eliminated, given Utah's consumptive use constraint under the Upper Colorado River Compact. On the other hand, for two more 'probable' levels of energy development, including the Energy Research and Development Administration's projections for the year 2000, only minor reductions in irrigated acreages would be expected. Under conditions of severe, prolonged drought, energy demands would consume almost all the water currently used in agriculture, given either of the 'probable' scenarios.  
W78-11211

**SOME POLITICAL-INSTITUTIONAL FACTORS AFFECTING EFFORTS TO CONSERVE WATER IN WASHINGTON STATE,** Washington State Univ., Pullman. Dept. of Political Science.  
For primary bibliographic entry see Field 6E.  
W78-11212

### 6C. Cost Allocation, Cost Sharing, Pricing/Repayment

**LIABILITY FOR MARITIME OIL POLLUTION: A COMPARISON OF THE MAINE COASTAL CONVEYANCE ACT WITH FEDERAL LIABILITY PROVISIONS,**  
For primary bibliographic entry see Field 6E.  
W78-10863

**ASSESSING THE SOCIAL EFFECTS OF WATER QUALITY MANAGEMENT PROGRAMS,** Georgia Inst. of Tech., Atlanta. Environmental Resources Center.  
For primary bibliographic entry see Field 5G.  
W78-11062

**THE TWO-TIERED MARKET IN WESTERN WATER,** New Mexico Univ., Albuquerque. School of Law.  
For primary bibliographic entry see Field 6E.  
W78-11157

### 6D. Water Demand

**SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES—SOURIS-RED-RAINY REGION,** Geological Survey, St. Paul, MN. Water Resources Div.  
For primary bibliographic entry see Field 4B.  
W78-10636

**THE IMPACT OF WATER RIGHTS AND LEGAL INSTITUTIONS ON LAND AND WATER USE IN 2000,** Iowa State Univ., Ames. Center for Agricultural and Rural Development.  
W. A. Colette, E. O. Heady, and K. J. Nicol.  
CARD Report 70, November, 1976. 85 p.

**Descriptors:** \*Economic prediction, \*Forecasting, \*Rural sociology, \*Water allocation(Policy), Agriculture, Community development, Competing uses, Econometrics, Land use, Planning, Probability, Legal aspects, Rural areas, Social aspects, Statistical methods, Water distribution(Applied), Water law, Water policy, Water pollution, Water rights, Water utilization.

There has been increased pressure for a reallocation of water and a review of the system of water rights in the United States. The economy has shifted from an agricultural orientation through an industrial phase and now is becoming service oriented. However, it is not clear that the best interests of society would be served by the elimination of existing water rights and priorities just because proponents of urban growth wish to obtain control of the water resources and divert them to urban and domestic uses. A national policy that eliminates water rights and reallocates existing agricultural water supplies in terms of marginal value productivities would affect the agricultural land use pattern in the United States. It would also cause increased utilization of dryland for crops and decreased use of irrigated land for crops, resulting in a net increase in the amount of land planted to crops. A main effect of the abolition of water rights on agricultural land would be an increase in the dominance of the north central region in American agriculture. In addition, such a policy would decrease the flexibility of American agriculture. (Jordan-Florida)  
W78-10803

**FEDERAL RECLAMATION AND WATER RIGHTS IN NEVADA,** California State Univ., San Diego. Dept. of History.  
For primary bibliographic entry see Field 6E.  
W78-10974

**AN EXAMINATION OF FREQUENCY OF PARTICIPATION IN WATER-BASED ACTIVITIES BY RECREATION CONSUMERS IN INDIANA,** Purdue University, Lafayette, IN. Dept. of Forestry and Natural Resources.  
J. T. O'Leary, and G. Pate.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 822.

Price codes: A02 in paper copy, A01 in microfiche.  
Purdue University Water Resources Research Center, Technical Report 114. Aug. 1978. 18 p., 4 tab., 17 ref. OWRT A-051-IND(1).

**Descriptors:** \*Recreation, \*Recreation demand, \*Social participation, Social aspects, Recreation facilities, \*Indiana, \*Socio-economic aspects, \*Social aggregates, Social action.

The water-based activity involvement of participants at state and federal and local and private facilities identified by using participation rate groups is examined. No differences between participant groups within activities based on socio-economic characteristics were found. However, groups of highly active individuals were identified at both types of properties. It is suggested that social action system variables be added to traditional social aggregate variables to assist the understanding of leisure involvement.  
W78-11066

**ALLOCATION OF RIGHTS TO WATER: PREFERENCES, PRIORITIES AND THE ROLE OF THE MARKET,** Florida State Univ., Tallahassee. School of Law.  
For primary bibliographic entry see Field 6E.  
W78-11159

### 6E. Water Law and Institutions

**WATER RIGHT ABANDONMENT,** Wyoming Gen. Laws secs 41-47.1 (1976 Supp.).

**Descriptors:** \*Wyoming, \*Reservoirs, \*Beneficial use, \*Prior appropriation, \*Water allocation(Policy), Appropriation, Irrigation water, Legal aspects, Legislation, Prescriptive rights, Regulated flow, Unappropriated water, Water law, Water rights, Water storage, Water utilization, Remedies, Regulation, Administration, Administrative agencies, State governments.

Where the holder of an appropriation of water from a surface, underground or reservoir water source fails, either intentionally or unintentionally, to use the water for the beneficial purposes for which it was appropriated during any five successive years, he is considered as having abandoned the water right and shall forfeit all water rights and appurtenant privileges. The state engineer may initiate forfeiture proceedings against the appropriator with the state board of control, to determine the validity of the unused right. The holder of an appropriation from which water or a portion thereof has not yet been beneficially used for the purpose for which appropriated, may apply to the board of control for an extension of time not to exceed five years. In the application, the holder shall demonstrate the exercise of due diligence toward the utilization of the appropriation, and that notwithstanding the exercise of due diligence, reasonable cause exists for nonuse. Reasonable cause includes, but is not limited to delay due to: court and administrative proceedings; requirements of state and federal statutes; and any other causes beyond the control of the holder of the appropriation. (Jordan-Florida)  
W78-10501

**INFORMATION EXCHANGE ON COMPUTER PROGRAMS (ECHANGE D'INFORMATION DES PROGRAMMES D'ORDINATEURS),** International Inst. for Hydraulic and Environmental Engineering, Del Delft (Netherlands); and Waterloorkundig Lab., Delft (Netherlands).  
For primary bibliographic entry see Field 7C.  
W78-10664

**REPORT OF THE PRESIDENT'S WATER POLLUTION CONTROL ADVISORY BOARD HELD AT HONOLULU, HAWAII ON JUNE 7-10, 1971.**  
President's Water Pollution Control Advisory Board Washington, DC.

For primary bibliographic entry see Field 5G.  
W78-10755

**PUBLIC ACCESS TO THE GREAT LAKES. A POLICY STUDY/1976.**

Wisconsin Coastal Management Program, Madison.  
M. T. Newman.

Available from National Technical Information Service, Springfield, Virginia 22161 as PB-263 933.  
Price codes: A04 in Paper, A01 in Microfiche.

Descriptors: \*Wisconsin, \*Great Lakes, \*Public access, \*State governments, \*Water policy, Cities, Commercial fishing, Great Lakes region, Governmental interrelations, Lake Michigan, Land use, Local governments, Navigation, Planning, Political restraints, Recreation, State jurisdiction, Water law, Water resources, Urban area.

The concept of public access has been defined as a way or a means of getting to and using the Great Lakes. The access question encompasses visual, legal, social and economic access, the barriers that inhibit them and the tools that are available to enhance them. Under the Wisconsin trust doctrine, the state holds title to the beds of navigable lakes in trust for all of the citizens. Public access to the Great Lakes serves the recreational, commercial and navigational users of Wisconsin waters. Four future choices for public access are discussed in this article. The first is to maintain the status quo. The second is to allow maximum access even though this may entail environmental costs to society. The third choice is to allow minimum access which would limit recreational use of Wisconsin waters. The fourth alternative is a combination of increasing some types of access such as, ramp access and decreasing or maintaining the present level of others such as shore and harbor access. This recombination of access directions is the actual future choice implemented by most communities and state policy makers since it can be made to serve particular needs of each situation. (Jordan-Florida).  
W78-10756

**OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN.**  
California Univ., Berkeley. Lawrence Berkeley Lab.

For primary bibliographic entry see Field 5G.  
W78-10757

**HEARING INVOLVING 180-DAY NOTICE OF VIOLATION OF WATER QUALITY STANDARDS OF THE CITY OF FARGO, NORTH DAKOTA HELD IN FARGO, NORTH DAKOTA ON JULY 10, 1970.**

Federal Water Quality Administration, Washington, DC.  
For primary bibliographic entry see Field 5G.  
W78-10758

**HAZARDOUS WASTE DISPOSAL PROGRAM SEVENTH MONTHLY REPORT.**

TRW Systems Group, Redondo Beach, CA.  
For primary bibliographic entry see Field 5G.  
W78-10760

**AUDIT GUIDE FOR FINAL STATE AUDITS UNDER THE CONSTRUCTION GRANT PROGRAM (FOR USE BY INDEPENDENT PUBLIC ACCOUNTANTS).**

Environmental Protection Agency, Washington, D.C. Office of Audit.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 375.  
Price codes: A07 in paper copy, A01 in microfiche.  
April, 1973, 48 p.

Descriptors: \*Federal Water Pollution Control Act, \*Administrative agencies, \*Project post-evaluation, \*Construction costs, \*Cost analysis, Federal government, Regulation, Administrative costs, Comprehensive planning, Economics, Management, Budgeting, Economic justification, Estimated costs, Financing, Capital costs, Cost allocation, Administration, Federal project policy, Water Quality Act, Sewage treatment.

State and municipal agencies are eligible for sewage treatment plant construction grants from the federal government under the Federal Water Pollution Control Act. Responsibility for the grant program lies with the Environmental Protection Agency (EPA). The EPA has established auditing procedures, set forth in this guide for the use of independent public accounts employed to conduct final site audits of grantees' facilities. The purpose of the audits is to determine grant costs. Also, the auditor ascertains whether: the grantee has complied with grant provisions; funds were properly spent and accounted for; facilities are maintained and managed properly; and management of the construction grant program can be improved. Auditors must pay special attention to unallowable costs, including: site costs; interests; damage awards; bonus payments; cost overruns; normal government costs; costs prior to acceptance of the grant (except certain pre-engineering costs); and costs after expiration of the grant. Audit reports follow a basic format. The opening paragraph identifies the grant and period audited. An opinion statement, preferably unqualified, presents the financial data and audit results. Compliance reviews, financial reviews, and background information comprise the remainder of the report. (Malefatto-Florida)  
W78-10763

**WATER QUALITY STRATEGY PAPER. A STATEMENT OF POLICY FOR IMPLEMENTING THE REQUIREMENTS OF THE FEDERAL WATER POLLUTION CONTROL ACT AS AMENDED AND CERTAIN REQUIREMENTS OF THE 1972 MARINE PROTECTION RESEARCH AND SANCTUARIES ACT.**

Environmental Protection Agency, Washington, DC.  
For primary bibliographic entry see Field 5G.  
W78-10764

**MINIMAL REQUIREMENTS FOR A WATER QUALITY ASSURANCE PROGRAM.**

Environmental Protection Agency, Washington, DC. Monitoring and Data Support Div.  
For primary bibliographic entry see Field 5G.  
W78-10765

**WASTE WATER DISPOSAL AT FEDERAL INSTALLATIONS IN THE UNITED STATES, STATE OF CALIFORNIA.**

Federal Water Pollution Control Administration, Washington, DC.  
For primary bibliographic entry see Field 5E.  
W78-10767

**SOME LEGAL ASPECTS OF CATFISH AND CRAWFISH FARMING IN LOUISIANA: A CASE STUDY.**

Louisiana State Univ., Baton Rouge. Center for Agricultural Sciences and Rural Development.  
E. Williams, F. S. Craig, and J. W. Ault.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 787.  
Price codes: A02 in paper copy, A01 in microfiche.  
Bulletin No. 689, LSU-R-76-003, December, 1975.  
18 p.

Descriptors: \*Fish farming, \*Aquaculture, \*Legislation, Fish handling facilities, Farm ponds, Agriculture, Fish harvest, Legal aspects, Fish, Catfishes, Freshwater fish, State government, Federal governments, Regulation, Permits, Water rights, Water law, Fisheries, Farms.

Raising catfish and crawfish has become an integral part of agriculture in Louisiana. However, Louisiana's laws pertaining to fish farming are confused. Many recent enactment conflict with laws passed before fishing farming became an important industry. To raise domesticated fish for commercial markets, a farmer must first obtain a license from the state Wildlife and Fisheries Commission. The farmer should then construct ponds or reservoirs for raising fish on private property. Ponds located within the basins of a continuously flowing river, bayou, or other stream are not subject to private ownership and use. Fish raised in such ponds are not considered 'domesticated.' Although there are no specific state laws regulating the construction of ponds, the fish farmers must comply with all relevant local ordinances. Water for the ponds may be obtained from streams or wells. In choosing a species suitable for raising, the farmer must be aware of the various restrictions imposed by law. For example, freshwater game fish may not be sold. All drainage of fish ponds into state streams must meet federal and state water quality standards. Guidelines for harvesting, processing and marketing of fish are also set forth. (Malefatto-Florida)  
W78-10768

**ACCOMPLISHMENT PLAN. REGION VIII. CHEYENNE RIVER BASIN AREA.**

Environmental Protection Agency, Denver, CO. Region VIII.  
For primary bibliographic entry see Field 5G.  
W78-10769

**DEVELOPING A WATER RESOURCE PLAN FOR SOUTH FLORIDA.**

South Florida Water Management District, Tampa.  
For primary bibliographic entry see Field 6B.  
W78-10770

**THE DUTIES AND RIGHTS OF OPERATORS OF WATER RETENTION STRUCTURES.**

Connecticut Univ., Storrs. School of Law.  
C. Davis.  
Nebraska Law Review, Vol. 57, No. 2, p 319-32, 1978.

Descriptors: \*Alteration of flow, \*Natural Flow Doctrine, \*Reasonable use, \*Riparian rights, Adjacent land owners, Flow control, Riparian land, Riparian waters, Water law, Water rights, Negligence.

Eastern, or riparian, water law has traditionally and primarily been concerned with the allocation of a short supply of water. In allocation cases, courts have tried to reconcile the property theory of natural flow and the tort theory of reasonable use. However, there are cases in which the natural flow increased due to heavy runoffs, and downstream owners sued the upstream operator of a water retention structure alleging that its negligent operation, and not its failure, caused excess waters to overflow their lands. If natural flow plays a significant role in fixing minimum flows to allocate short supplies, then the natural flow of a stream, including freshlets and occasional heavy runoff, should play a role in fixing a permissible maximum flow. The reasonable duty of an operator might be to cut the crest, or distribute the higher flow over a longer period, but courts should take care not to demand that the crest be cut and higher than normal releases not be made at other times. The standard for water structure management should be that of other professionals in the area. (Jordan-Florida)  
W78-10773

### Group 6E—Water Law and Institutions

Central Midlands Regional Planning Council,  
Columbia, SC.  
March 28, 1974. 9 p.

**Descriptors:** \*South Carolina, \*Drainage systems, \*Flood control, \*Local government, Cities, Drainage engineering, Drainage practices, Flood protection, Storm drains, Surface runoff, Urban drainage, Storm runoff.

It is the intent of this model ordinance to protect the general health, safety and damages of flooding from the various drainage areas of Columbia, South Carolina and adjacent county lands. All subdivisions of land and all developments or improvements of any character which affect drainage should be subject to the provisions of the ordinance. The stated purposes for adopting such an ordinance include: (1) ensure adequate drainage improvements; (2) develop uniform standards for pipe and channel dimensions; (3) promulgate consistent design standards; (4) define financial responsibility for improvements for the developer and local governments; and (5) ensure clean and sanitary drainage channels. The improvement of primary drainage channels shall be the long-range responsibility of the city or county, and the improvement of secondary drainage areas shall be the responsibility of the developer. However, all primary drainage channels which are located within or immediately adjacent to an improvement, development, or subdivision shall be protected and improved by the developer. The city or county shall reserve the right to require improvements for flood control. (Jordan-Florida)

W78-10774

Cambridge Univ. (England). School of Law.  
G. Marston.

The British Yearbook of International Law, Vol. 46, 1972-73, p 405-23, 1975.

**Descriptors:** \*Law of the sea, \*International law, \*Conferences, \*Boundary disputes, Governments, Low water mark, High water mark, Prescriptive rights, Water law, Jurisdiction, Treaties, Water zoning, Sites, International waters, Tidal waters, Water level fluctuations, Tides, Judicial decisions. Coasts.

Article 4 of the 1958 Geneva Convention on the Territorial Sea and the Contiguous Zone defines internal waters as those waters over which a coastal state possesses the fullest possible legal measure of control. Where the coastline of a state is jagged, or where there exist a fringe group of islands, Article 4 permits the use of the method of straight baselines joining appropriate points in drawing the baseline from which the breadth of the territorial sea is measured. Conflicts of interest arise between coastal states wishing to extend their internal waters by drawing baselines in their favor and other states protecting their shipping interests and passage rights. The Anglo-Norwegian Fisheries Case, 1949-51, is just one example of these conflicts. Paragraph 3 of Article 4, regarding low-tide, is another source of conflict. Legal problems regarding the interpretation of this paragraph such as does it apply to nonparties, are there exceptions to the rule, and are there restrictions regarding permanent structures on low tide elevations, will require close attention at the third United Nations Conference on the Law of the Sea. (Curtis-Florida)  
W78-10775

For primary bibliographic entry see Field 5G.  
W78-10776

D. L. Hutchinson.  
University of Colorado Law Review, Vol. 48, No. 4, p 547-573 (Summer, 1977).

**Descriptors:** \*Federal-state water rights conflicts, \*Reservation doctrine, \*Water policy, \*Prior appropriation, Legal aspects, Colorado, Nevada, Water law, Riparian rights, Public laws, Federal reservations, Water rights, Water allocation(Policy), Governmental interrelations, State governments, Watercourses(Legal aspects), Beneficial use, Diversion, Preferences(Water rights), Methodology, Judicial decisions.

When the federal government withdraws land from the public domain and reserves it for a federal purpose, by implication, appurtenant water then unappropriated is also reserved. Reserved water rights vest on the date of reservation and are superior to the rights of future appropriators. The author explores possible meanings for the phrases 'unappropriated waters' and 'future appropriators' in relation to determination of reserved rights priorities. The author also discusses the appropriation doctrine which provides for acquisition of water rights by diverting water from a water-course and putting it to a beneficial use. Colorado's mandate system is compared with Nevada's permit system. Three alternative methods for determining priority for federal reserved rights are analyzed in terms of workability, coordination with state appropriation systems, and advantages or disadvantages to state, private, and federal interests. The author recommends that state systems should be adopted in their entirety to eliminate specified difficulties in state water rights administration. Most problems arise when the date of creation of the reservation is compared with the date of appropriation by a competing appropriator, or when seniority is provided only to state interests which are 'choate' as of the date of reservation. (Hoofman-Florida)

W78-10777

Holland and Hart, Denver, CO.  
C. M. Elliot, and K. Balcomb.  
Denver Law Journal, Vol. 53, No. 4, p 643-662  
(1976). 1 fig.

**Descriptors:** \*Federal-state water rights conflict, \*Reservation doctrine, \*State jurisdiction, \*Federal jurisdiction, Colorado, Jurisdiction, Judicial decisions, Legal review, Water rights, Federal reservations, Public lands, Prior appropriation, Legislation, Colorado River Basin, Rivers, Riparian rights, Water law, Indian reservations, United States.

When the federal government withdraws land from the public domain and reserves it for a federal purpose, by implication appurtenant water then unappropriated is also reserved. Reserved water rights vest on the date of reservation and are superior to the rights of future appropriators. The author discusses judicial treatment of the implied reservation doctrine and the question of whether federal or state courts should adjudicate federal-state water rights conflicts. Based on the McCarran Amendments' waiver of federal sovereign immunity, the Supreme Court has held that Colorado state courts may adjudicate appropriative rights, riparian rights, and reserved rights. In *Akin v. United States* (Akin), an action was brought in federal court by the United States for certain Indian tribes to determine federal water rights in the Colorado River Basin tributaries. Meanwhile, the United States was joined in an overlapping state adjudication. The Supreme Court upheld dismissal of the federal court case based on 'wise judicial administration' rather than abstention. After examining the pros and cons outlined in the Akin decision, the author concludes that state adjudication of local water rights has substantial advantages. (Hooftman-Florida)

### COASTAL CONFLICTS AND THE COURTS, E. A. Wilman.

Descriptors: \*Federal-state water rights conflicts, \*Coasts, \*Management, \*Governmental interrelations, Judicial decisions, Federal jurisdiction, State jurisdiction, Coordination, Land management, Washington, California, Comprehensive planning, Water law, Water resources development, Water resources, Continental Shelf, Natural resources, Oil Leases, Regulation, Grants.

Federal and state conflicts over coastal management are illustrated by three current Supreme Court cases. Ray v. Atlantic Richfield Company addresses the issue of whether Washington state's tanker law is preempted by the federal Port and Waterways Safety Act, County of Suffolk v. Aguirre addresses the issue of whether the Secretary of the Interior concerns whether a Department of the Interior Environmental Impact Statement, regarding a Baltimore Canyon Outer Continental Shelf (OSC) oil and gas lease sale, fully complied with National Environmental Policy Act requirements. The third case questions federal approval of California's Coastal Plan. The author outlines development impacts on coastal environments which prompted federal and state legislation. The Coastal Zone Management Act (CZMA) of 1972, which set up a framework for coastal resources management, provides federal incentives and grants for development of state coastal management programs. The CZMA Amendments of 1976 concern development of coastal and OCS energy resources and establish a Coastal Energy Impact Program to mitigate adverse impacts. State coastal regulation and management frameworks are criticized for inadequate assessment and distribution of benefits and costs. As an alternative to licensing, the use of transferable development rights is recommended. Present and future issues concerning conflicting state and federal interests are also discussed. (Hoofman-Florida)

W78-10779

**DIES: EXISTING LEGAL AUTHORITIES:**  
Florida Dept. of Natural Resources, Tallahassee.  
Bureau of Coastal Zone Planning.  
Available from Bureau of Coastal Zone Planning,  
2562 Executive Center Circle East, Montgomery  
Building, Tallahassee, Florida 32301. July, 1977.  
20 p. 2 tab.

**Descriptors:** \*Florida, \*Coast, \*Land management, \*Regions, \*Local governments, Management, Governmental interrelations, Management, State governments, Zoning, Regulation, Administration, Grants, Land use, Administrative agencies, Planning, Environmental effects.

An analysis of existing North Central Florida coastal zone management is presented in this booklet. Critical elements representing the core of sound coastal zone management are listed. An inventory of existing local and regional agencies and a breakdown of their primary and secondary responsibilities is presented. Also identified are the general levels of government involved in decision making processes concerning: (1) upland land use; (2) submerged land use; and (3) use of marine waters. The critical coastal zone elements posing the greatest potential for agency conflict are identified. Other areas of concern include: (1) fragmentation of the responsibilities and jurisdiction concerning coastal zone management due to the number of federal, state, and local agencies involved; (2) growth in management duties without corresponding increase in technical and monetary resources; and (3) lack of coordination between existing agencies. In conclusion, a number of recommendations are made to help facilitate local government compliance with Florida's Local



Government Comprehensive Planning Act of 1975 and the state coastal zone management plan. (Hoffman-Florida)  
W78-10780

**CONFLICTS BETWEEN PRIVATE APPROPRIATORS OF STREAM FLOWS AND USERS OF GROUND WATER IN NEBRASKA,**  
W. E. Holland.  
Creighton Law Review, Vol. 10, No. 4, p 592-612, June, 1977.

Descriptors: \*Nebraska, \*Prior appropriation, \*Reasonable use, \*Relative rights, Legal aspects, Water rights, Appropriation, Surface-groundwater relationships, Prescriptive rights, Groundwater, Streamflow, Preferences (Water rights), Priorities, Water policy, Condemnation, Condemnation value.

Nebraska water law is split into two inconsistent systems. Groundwater is allocated by 'reasonableness' of the use in relation to the needs of all users; stream flow for irrigation purposes is allocated by priority of use in time. Incompatibility of rules and policies between the two systems leaves open questions as to how Nebraska courts will resolve conflicts between groundwater users and 'appropriators' of stream flow. Further open questions exist as to the prescriptive rights between parties under the differing systems. In order to maintain predictability of 'owners', the author favors priority of stream flow appropriation rights over the ground water 'reasonable use' system. He proposes legislation making ground water appropriations subject to any prior appropriation, whether surface or groundwater. To the extent that a groundwater use proves more efficient than a conflicting use of stream flow, however, the author suggests that groundwater users should be able to acquire the surface rights. This could be achieved either through a market transaction or through a state agency empowered to decide on the relative efficiency of conflicting uses and condemn the less efficient. (Baumbach-Florida)  
W78-10781

**LAND SUBSIDENCE: MENACE TO THE TEXAS GULF COAST,**  
Harris-Galveston Coastal Subsidence District, Houston, TX.  
J. E. DeBerry.  
Water and Sewage Works, Vol. 124, No. 5, p 54-56, May, 1977, 2 fig, 1 tab.

Descriptors: \*Land subsidence, \*Aquifer, \*Texas, \*Subsurface waters, Inundation, Water allocation (Policy), Artesian wells, Elevation, Sands, Soil structure, Soil pressure, Porosity, Tidal effects, Water demand, Water law, Ground water, Geological survey, Artesian aquifers.

In order to meet increasing industrial and domestic demands large volumes of water are being pumped from Texas underground water supplies. This pumping has resulted in subsidence of land along the Gulf Coast. Many Texas residents have experienced property loss as a result of inundation. Subsidence is the loss of land surface elevation. It relates to the structure of the soils, primarily clays and sands. The pumping of large volumes of water from the aquifer sands make it impossible for the aquifer to function properly for the water is drawn out faster than it can be returned. As a result the artesian pressure and the water level in the aquifer drops. Without the artesian pressure necessary to keep the pore water in the clay soils, the weight of the soil itself causes the pore water to be squeezed out, resulting in the loss of surface elevation. To help solve the problem, the 64th Texas Legislature passed House Bill 552 which created a special two county district, the Harris-Galveston Coastal Subsidence District. This district regulates the withdrawal of groundwater within its boundaries. A table with figures helps illustrate the problem. (Curtis-Florida)

W78-10782

**LAW OF THE SEA: THE SCOPE OF THE THIRD-PARTY, COMPULSORY PROCEDURES FOR SETTLEMENT OF DISPUTES,**  
United Nations, New York. Office of Legal Affairs.  
A. D. Adede.  
American Journal of International Law, Vol. 71, p 305-11, April, 1977.

Descriptors: \*Adjudicating procedure, \*International law, \*Law of the sea, \*Treaties, \*United Nations, Coasts, Continental margin, Decision making, Economics, Foreign countries, Governments, Resources, International waters, Legal aspects, Military aspects, Management, Oceans, Water law, Exploitation.

Disputes relating to the exercise by a coastal State of sovereign rights, exclusive rights, or exclusive jurisdiction are subject to the procedure specified under the Law of the Sea Convention. It is believed that the establishment of the meaning of the crucial terms used in the Convention and their correct application will greatly assist negotiations on this important aspect of the Convention. The term 'sovereignty' is used to denote the usual broad and complete powers of a coastal state which are exercised over its territorial sea. The term 'sovereign rights' is used to denote a restriction on the coastal state's competence to those powers which are specifically related to the exploitation and management of resources in general. The term 'exclusive rights' is used to denote the rights reserved to the coastal states, within the exclusive economic zone, such as the establishment and use of artificial islands, installations and structures. The term 'jurisdiction' is used to denote the extent of the coastal states' rights within the exclusive economic zone with regard to the preservation of the marine environment. Despite the above definitions, it is difficult to classify all issues into neat categories for the purposes of third-party settlement. (Jordan-Florida)  
W78-10783

**FEDERAL COMMON LAW OF NUISANCE IN INTRASTATE WATER POLLUTION DISPUTES.**  
Washington University Law Quarterly, Vol. 1977, No. 1, p 164-77, Winter 1977.

Descriptors: \*Interstate, \*Common law, \*Federal Water Pollution Control Act, \*Water pollution control, Federal government, Judicial decisions, Abatement, Water pollution, Sewage, Federal jurisdiction, Waste water (Pollution), Legislation, Water law, Legal aspects, Pollution abatement.

In Committee for the Consideration of Jones Falls Sewage System v. Train, the Fourth Circuit evaded an opportunity to clarify the availability of federal common law nuisance actions to abate interstate water pollution. In that case, city and state officials had complied with the requirements of the Federal Water Pollution Control Act Amendments of 1972 (FWPCA of 1972). As a result, no claim under the statute was available to the committee which sought to enjoin a Baltimore sewage plant from adding new customers to its system. The citizens group, which neglected to allege the plants pollution had an interstate effect, based its request for an injunction on an asserted federal common law right. The court held that private citizens have no federal common law right to enjoin intrastate pollution. However, the court left unanswered the question of whether federal common law actions to abate interstate water pollution not enjoined under the FWPCA of 1972 are possible. The recent history of federal common law actions to abate water pollution is discussed. The author also analyzes the FWPCA of 1972, as well as several federal common law nuisance cases. (Howard-Florida)  
W78-10784

**AN ANALYSIS OF THE SCOPE OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT ON THE GARRISON DIVISION UNIT PROJECT: APPLYING A TOTALITY OF CIRCUMSTANCES TEST,**  
For primary bibliographic entry see Field 6G.  
W78-10785

**WHAT ARE THE METES AND BOUNDS OF A WAVE.,**  
Oregon State Univ., Corvallis. Dept. of Anthropology.  
C. L. Smith.  
Ocean Development and International Law Journal, Vol. 4, No. 4, p 369-79, 1977.

Descriptors: \*Resource allocation, \*Governmental interrelations, \*Boundaries (Property), Water pollution control, \*Boundary disputes, Coasts, Ownership of beds, International waters, Boundary processes, Regional economics, Ecological distribution, Ecosystems, Fish management, Fish migration, Water resources, Water properties, Water quality, Water pollution, Social impact, Political aspects.

Seaward extension of national boundaries will involve application of land based boundary concepts to the oceans. This poses problems since resources, ecological boundaries, and pollutants do not respect political jurisdictions. Additionally, it is argued that extension of national boundaries may lock up ocean resources for the coastal nations. International bargaining and negotiations will be necessary in order to delineate the distribution of resources which cross boundaries and accrue primarily in coastal regions. Similar negotiations will be needed to define environmental responsibilities. The author notes a potential for increased neighbor-to-neighbor conflict as new boundaries are worked out, and as institutions to manage fish pollutants and other resources that do not correspond with national boundaries are initiated. However, he predicts a potential of better relations between distant-water fishing nations and coastal states will be possible with extensions of jurisdiction, since the rights of each can be clarified. He concludes that the nature of oceanic hydrologic systems and water masses will, in the long run, make the world a closer community as the residues of one nation becomes the resources and discommodities of another. (Baumbach-Florida)  
W78-10786

**THE VIRGINIA COAST RESERVE: ACQUISITION STRATEGIES FOR COASTAL ZONE PRESERVATION,**  
Nature Conservancy, Arlington, VA.  
For primary bibliographic entry see Field 6F.  
W78-10787

**SHIPWRECKS, POLLUTION, AND THE LAW OF THE SEA,**  
Environmental Protection Agency, Washington, DC. Office of International Activities.  
R. J. McManus, and J. Schneider.  
National Parks & Conservation Magazine, Vol. 51, No. 6, p 10-15 (June, 1977).

Descriptors: \*Law of the Sea, \*Oil pollution, \*Oceans, \*International law, Pollutants, Ships, Coasts, Structural design, Pollutants, International waters, Oil spills, Compensation.

The recent spate of oil tanker casualties reinforces the author's belief that there is still no effective international law to protect the seas against such disasters. Some experts predict the biological death of the oceans within our lifetime if the present trends continue. Several man-made processes contribute to ocean degradation. These include the destruction of natural ground cover by coastal development, the addition of toxic materials to the oceans, and deliberate discharges from ships. Several methods used in controlling operating

## Field 6—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

discharges are explained in the article including the loadson-top technique and structural modification to vessels. The implementation of discharge standards is praised where present and called for where absent. The details of the treaty arising out of the Inter-Governmental maritime consultative Organization's Conference on marine Pollution are discussed along with possible interpretations. Certain proposals of the United States that would go beyond the international treaty are examined. One area of deficiency in the international arena cited and discussed is that of liability and compensation for oil pollution damage. The authors note that advancements made at the United Nations Conference on the Law of the Sea appear to be negligible. (Quarles-Florida)  
W78-10790

**GOOD TIMES FOR SOIL AND WATER CONSERVATION.**  
Library of Congress, Washington, DC. Congressional Research Service.  
K. A. Cook.  
Journal of Soil and Water Conservation, Vol. 33, No. 2, p 96-97 (March-April, 1978).

Descriptors: \*Soil conservation, \*Legislation, Land use, \*Water conservation, Water resources, Erosion, Federal government, State governments, Data collections, Irrigation, Erosion control, Agriculture.

In an effort to revitalize federal efforts to conserve America's Soil and water resources, Congress passed the Soil and Water Resources Conservation Act of 1977 (WRCA). The new Legislation was several years in the making with a similar act being vetoed by President Ford in 1976. The author examines the development of the WRCA, the reasons for its implementation, the provisions of the new law and its effect. Drought, erosion, and the food crisis of 1974-1975 brought United States agricultural policy under close public scrutiny. The WRCA squarely faced the need for new federal conservation programs. The author includes a detailed examination of the history of the bill in Congress and various objectives that were made. The WRCA has three major components that give it real potential to provide information on agricultural resources. The first section provides for the collection and synthesis of data for a continuing appraisal of the resource base. The second section forms the National Soil and Water Conservation program which will administer soil and water conservation efforts of the Department of Agriculture. The final component requires appraisal reports, policy statements, and recommendations for new legislation. The author notes that it is still too early to judge what effect the new law will have. (Quarles-Florida)  
W78-10791

**PLANNING AND SELECTING SITES FOR WATER STORAGE FACILITIES.**  
G. L. Groat.

Water and Sewage Works, Vol. 124, No. 9, p 111-116 (September, 1977). 8 fig.

Descriptors: \*Reservoir design, \*Storage tanks, \*Reservoir sites, \*Aesthetics, Water storage, Decision making, Cost-benefit analysis, Project planning, Design data, Engineering, Evaluation, Structural design.

Water storage facility planning has had to respond to increased citizen interest in neighborhood aesthetics. A 'Water Storage Guide' was recently developed to help provide guidelines and procedures for the evaluation and selection of water storage sites and designs. Several communities have adopted the guide as official policy. The guide delineates a six-step planning process: (1) environmental survey; (2) site and multiple use selection; (3) site and facility matching; (4) impact and cost evaluation; (5) impact cost tradeoffs; and (6) minimizing unavoidable impacts. The guide also

includes engineering guidelines, design and multiple use proposals, and specific suggestions for working with the community to insure an uninterrupted and non-controversial water storage construction program. The community acceptance section suggests that decision makers seek citizen participation. The guide suggests that engineering, economic and environmental factors considered in the selection of the preferred alternative be documented. The Water Storage Guide also includes useful graphs, maps and matrixes for use in analyzing land use sensitivity, aesthetic implications, and other impacts such as television interference. Use of the Guide has resulted in site and design combinations that are compatible with and complement the surrounding environment. (Baumbach-Florida)  
W78-10792

**APPROACH TO POLLUTION CONTROL AND LEGISLATION IN THE USA.**  
Water Pollution Control Federation, Washington, DC.  
V. G. Wagner.  
Water Pollution Control, Vol. 76, No. 3, p 277-279 (1977).

Descriptors: \*Water pollution control, \*Federal Water Pollution Control Act, Waste water treatment, \*Environmental effects, Economic justification, Water quality control, Legislation, Cost-benefit analysis, Waste treatment, Industrial wastes, Municipal wastes, Regulation.

Even into the early 1900's the abatement of water pollution was treated as a private matter between the polluter and the person claiming damage from the pollution. State law on pollution abatement evolved slowly and as late as 1940 few states had enforceable pollution laws. Following World War II and into the early 1960's, state control flourished and interstate compacts came into existence. In 1948, with the passing of the Federal Water Pollution Control Act (FWPCA), the federal government became dominant in the water pollution control effort. This leadership was expanded by the federal grant-in-aid program to municipal governments for the construction of publicly owned wastewater-treatment facilities. The federal role was further expanded with the FWPCA Amendments of 1972. The FWPCA Amendments require treatment of discharge water with the best practicable technology by 1977, and best available technology by 1983. The FWPCA Amendments set a 'zero pollutant discharge' goal. However, the author predicts this approach to pollution control will become less stringent, reflecting the high cost of such treatment in capital, maintenance costs, and high energy consumption. (Baumbach-Florida)  
W78-10793

**DEVELOPMENTS IN GROUNDWATER LAW.**  
Arizona Univ., Tucson. School of Law.  
R. E. Clark, and A. Arguedas, Jr.  
Nebraska Law Review, Vol. 57, No. 2, p 283-294 (1978).

Descriptors: \*Groundwater, \*Legislation, \*Judicial decisions, \*Water management (Applied), Groundwater mining, Groundwater availability, Water supply, Water quality control, Regulation, Planning, Water reuse, Water allocation (Policy).

In 1973, the National Water Commission emphasized the need for comprehensive state water legislation which would: integrate the management of surface water and groundwater; increase regulation of well drilling and groundwater 'mining'; and eliminate legal obstacles to the transfer of groundwater rights from one user to another. Because water law primarily is state property law, the most significant changes must therefore come from comprehensive changes in state laws. This commentary seeks to outline some of

the more important recent state legislative and judicial actions in this area. The examples outlined show an increasing awareness of the law's need to respond to surface-groundwater interrelationships as affecting users' rights. There is growing awareness of the need for more specific criteria for choosing between competing water demands. And there is growing recognition of the importance of reclamation and reuse within water management programs. The author suggests that these constructive judicial and legislative efforts should be examined and improved wherever possible. In many states these growing recognitions could be incorporated into comprehensive water management legislation that would meet the essential requirements outlined in the National Water Commission Report and also anticipate future interstate and international problems. (Baumbach-Florida)  
W78-10794

**WHO HAS CONTROL OVER RECLAMATION PROJECT WATER.**  
W. Wieking.

In: Western Water, p 5-8 (May-June, 1978). Available from Western Water Education Foundation, 1107 9th Street, Suite 618, Sacramento, California, 95814.

Descriptors: \*California, \*Water rights, \*Federal-state water rights conflicts, \*Reclamation, Dams, Water allocation (Policy), Permits, Water utilization, Federal Reclamation Law, Impoundments, Impounded waters, Reclamation states.

California v. United States, currently under consideration by the United States Supreme Court, is further evidence of the continuing importance of the water issue in California. The case revolves around the question of whether California has the authority to impose conditions on the development and use of water derived from reclamation projects. The author explores the origins and developments of the controversy which arose out of the construction of the New Melones Dam. The California State Water Resources Control Board (WRCB) decided in 1973 that sufficient unappropriated water was available. However, when approving the United States' permit to appropriate water for the dam project, the WRCB established numerous conditions on the use and impoundment of that water. The United States claimed that under the Reclamation Act a state has no authority to set such conditions. The author considers the effect of the Reclamation Act and the reasons for the New Melones Dam project. The rationale of the California WRCB is set forth along with the legal arguments of both parties. The author expects the case will set precedent for the other sixteen reclamation states. (Quarles-Florida)  
W78-10795

**CHANGING RECLAMATION LAW TO MEET THE TIMES.**  
W. Wieking.

In: Western Water, p 9-12 (May-June, 1978). Available from Western Water Education Foundation, 1107 9th Street, Suite 618, Sacramento, California, 95814.

Descriptors: \*Reclamation, \*Federal Reclamation Law, \*Irrigation water, \*Reclaimed water, California, Federal government, Federal project policy, Reclamation states, Agriculture, Regulation, Irrigated land, Legislation.

Farmers in reclamation states who depend on reclamation projects for their irrigation water are in an uproar following the issuance of the Secretary of Interior's newly proposed regulation for acreage limitation. The regulation was issued in response to a federal district court's order. The issuance of these proposals resulted in congressional hearings and a number of Senate bills which would modify reclamation law. The Secretary's proposed changes call for: (1) a limit of 160 acres

owned or leased by each family member; (2) purchase of excess lands shall be chosen by lottery but a family relationship with the seller results in preference; (3) all purchasers must live within fifty miles of the land; (4) the sale must occur within five years; and (5) the sale price shall be established by the Secretary of the Interior. The author examines these proposals in detail and also discusses alternative proposals contained in various congressional bills. All of the bills call for some form of revision of reclamation law. Each is examined individually. It is unclear at this point whether one of these bills will be adopted or whether a compromise solution will appear. (Quarles-Florida)  
W78-10796

#### REGULATORY PROGRAMS FOR NONPOINT POLLUTION CONTROL: THE ROLE OF CONSERVATION DISTRICTS.

National Association of Conservation Districts, Washington, DC.

For primary bibliographic entry see Field 5G.  
W78-10797

#### SPECIFIC PROBLEM ANALYSIS. 1975 NATIONAL ASSESSMENT OF WATER AND RELATED LAND RESOURCES (MISSOURI REGION).

Missouri River Basin Commission, Omaha, NE.  
August, 1977, 16 p.

Descriptors: \*Regional analysis, \*Water resources, \*Water management (Applied), Missouri River, \*Assessments, Cost-sharing, Water users, Irrigation, Erosion control, Conservation, Alternative water use, Water supply, Surface-groundwater relationships, Energy, Water rights, Groundwater, Surface waters, Recreation demand, Water quality, Municipal water.

The principal agency for coordination of federal, state, interstate, and local plans for water and related land resources development in the area served by the Missouri River and its tributaries is the Missouri River Basin Commission (MRBC). This article summarizes the work of the MRBC during the 1975 National Assessment of Water and Related Land Resources. The objectives of the assessment were to identify existing and emerging needs and problems, relate these to the adequacy of resources to meet requirements and goals of the people for conservation, development, use and management, and identify complex problems requiring detailed planning. Maps and tables are included in discussion of water resources development, Indian water, alternative uses of water, water supply, cost-sharing, water related recreation needs, erosion, navigation requirements, flooding, water quality, and other topics of concern to the region. The discussions indicate needs, problems and trends in these areas of water resources and serve as background for the Commission's list of recommendations which basically call for further studies and accelerated federal funding to further the cooperative efforts of the Commission. (Spector-Florida)  
W78-10798

#### SUMMARY GUIDE TO FLORIDA'S WATER RIGHTS.

Spessard L. Holland Law Center, Gainesville, FL.  
J.B. Wadley.

Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida Circular 412, (1977), 24 p.

Descriptors: \*Florida, \*Public rights, \*Riparian rights, \*Water rights, Groundwater, Legislation, Navigable waters, Non-navigable waters, Pollution abatement, Regulation, Surface waters, Permits.

Summarized in this booklet are the legal aspects of acquisition and preservation of water rights and

the substantive content of those rights in Florida. The booklet is intended to inform farmers and other landowners about the general characteristics of Florida's water law. The introduction outlines the nature of the right to use water in Florida and the way in which this right has been affected by the Florida Water Resources Act of 1972 (FWRA). The nature and extent of riparian rights are examined along with a discussion of natural navigable and non-navigable waterbodies. Rights of the general public to use such waterbodies are explained and contrasted with those of riparian landowners. The author discusses a landowner's rights with regard to groundwater and diffused surface water, and examines the permitting procedures mandated by the FWRA. A summary of the regulatory function of various governmental agencies involving pollution control, water management, and dredging and filling is provided along with the mailing addresses of those agencies. Explanations of Areas of Critical State Concern and Endangered Lands are also presented. (White-Florida)  
W78-10800

#### ENVIRONMENTAL PROTECTION: MODEL ORDINANCES FOR USE BY LOCAL GOVERNMENTS.

Metropolitan Council of the Twin Cities Area, MN.  
March, 1977, 80 p.

Descriptors: \*Minnesota, \*City planning, \*Environmental effects, \*Local government, Cities, Environmental control, Land use, Mining, Natural resources, Planning, Water resources development, Zoning.

In 1974, the Minnesota Legislature directed the Metropolitan Council to develop model ordinances for the protection of natural resources in the Twin Cities Metropolitan Area. The intent of the legislation was to encourage local units of government to adopt and enforce sound policies regulating the subdivision, use and development of the limited land and water resources of the Metropolitan Area. The model ordinance offers three approaches: (1) a comprehensive site planning ordinance; (2) a series of over-lay district ordinances, each directed to the protection of a specific resource; and (3) a conservation district ordinance. A Mineral Extraction Ordinance is directed to minimizing the impact of such activity where it is occurring. The Council has also prepared a model ordinance to create a district zoned for agricultural land use. A reasonable balance must be achieved in the Metropolitan Area among natural resources protection, urban development and the need to provide adequate housing. Local governments are free to choose those model ordinances which apply in their jurisdictions and to vary the standards and requirements to best suit the local situation. (Jordan-Florida)  
W78-10801

#### REVIEW OF EXISTING STATE LAND USE REGULATION IN FLORIDA—AN OVERVIEW.

Florida Law Revision Council, Tallahassee. Office of Statutory Revision.  
F. W. Baggett, and D. Guthrie.  
February, 1975, 75 p.

Descriptors: \*Legislation, \*Administration, \*Land management, \*Comprehensive planning, \*Florida, Water management (Applied), Natural resources, Land use, Land management, Management, Environmental control, Administrative agencies, Permits, Water law, Water resources planning, Regulation, Law enforcement.

Existing Florida laws regulating land use are reviewed as to purpose, scope, administration, statutory limitations, and enforcement. The Environmental Protection Act of 1971 provides for actions against violators of air, water, and natural

resource laws. Injunctive relief may be obtained except instances where a person or an agency charged with a violation is acting in compliance with a currently valid permit. The Environmental Land and Water Management Act provides that Florida must establish land and water management policies to facilitate growth and development decisions. The act covers areas of critical state concern and developments of regional impact. It is administered by the Florida Land and Water Adjudicatory Commission, which consists of the governor and the cabinet. The Florida Environmental Reorganization Act centralizes responsibility for environmental management and authorizes decision-making authority to the district level. Activities of the Department of Environmental Regulation and Department of Natural Resources are coordinated. Also reviewed are Chapter 23, State Comprehensive Planning; Chapter 160, Regional Planning Councils; Chapter 177, Maps and Plats; Chapter 253, Internal Improvement Trust Fund; Chapter 75-204, New Communities Act of 1975; and Chapter 75-257, Local Government Comprehensive Planning Act. (Rule-Florida)  
W78-10802

#### THE IMPACT OF WATER RIGHTS AND LEGAL INSTITUTIONS ON LAND AND WATER USE IN 2000.

Iowa State Univ., Ames. Center for Agricultural and Rural Development.  
For primary bibliographic entry see Field 6D.  
W78-10803

#### PROPERTY RIGHTS TO GEOTHERMAL RESOURCES (PART ONE).

California Univ., Berkeley. School of Law.  
S. Sato, and T. D. Crocker.  
Ecology Law Quarterly, Vol 6, No 2, p 250-321 (1977).

Descriptors: \*California, \*Electric power, \*Geothermal studies, \*Land tenure, \*Thermal power, Electricity, Energy conversion, Energy gradient, Geology, Geophysics, Heat, Public rights, Public utilities, Real property, Steam, Thermal powerplants, Thermal properties, Thermal water, Legislation, Common law.

Geothermal energy is being exploited currently only in areas where fluid is present in hot rock formations beneath the surface of the earth. There has been much speculation as to whether the allocation of geothermal resources should be governed by a property regime applicable to water or other resources. A critical issue is whether rights to geothermal resources are retained by the state and federal governments under the express mineral reservations required by the various statutes governing the patenting of land. Some landowners have argued that geothermal resources are 'water' and therefore are not covered by the reservations. However, the unique characteristic of geothermal resources—heat energy—should preclude its classification as 'water.' In addition, the common law doctrine that surface ownership carries with it the absolute ownership of all that lies beneath the land should not be applied to geothermal resources. This doctrine has been rejected in other areas, notably the control of percolating groundwater and airspace, in favor of a rule which protects only justified expectations surface related uses. (Jordan-Florida)  
W78-10806

#### GONE WITH THE WATER—DRAINAGE RIGHTS AND STORM WATER MANAGEMENT IN PENNSYLVANIA.

Pennsylvania Dept. of Environmental Resources, Harrisburg.  
R. T. Weston.  
Villanova Law Review, Vol 22, No 5, p 901-82 (1976-1977).



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### Group 6E—Water Law and Institutions

Descriptors: \*Pennsylvania, \*Drainage, \*Storm water, \*Management, \*Planning, Flood control, Storms, Natural flow, Municipal water, Water resources, State governments, Damages, Watershed management, Land use, Structures, Diversion, Reasonable use.

The purpose of this article is to explore the interrelated issues of drainage rights, storm water and flood control programs and flood plain management in Pennsylvania. Noting that drainage law and storm water management are matters of public as well as private concern, the article concludes that: (1) a more integrated approach buttressed by clearly enunciated public policies and laws is essential; (2) prior planning is a prerequisite to any rational storm water management program; storm water management policy should conserve natural drainage characteristics as part of an economically efficient and equitable program; (3) for any solution to be successful, intermunicipal conflicts must be resolved and storm water problems must be addressed on a watershed-wide basis; (4) drainage rules should retain essential flexibility while providing sufficient certainty to guide private and public development decisions; (5) storm water management should be sensitive to and compatible with the attainment of other water resource and environmental objectives; and (6) storm water management considerations should be an integral aspects of land use planning and development programs. In addition, the author feels that future storm water management programs must be capable of administration and implementation through realistic manpower and budgetary resources. (Easterbrook-Florida) W78-10807

**THE ECONOMIC IMPACT OF THE FEDERAL ENVIRONMENTAL PROGRAM: A REPORT TO THE SUBCOMMITTEE ON AGRICULTURE, ENVIRONMENTAL AND CONSUMER PROTECTION OF THE COMMITTEE ON APPROPRIATIONS OF THE HOUSE OF REPRESENTATIVES,**  
Environmental Protection Agency, Washington, DC.  
For primary bibliographic entry see Field 5G.  
W78-10809

**A REPORT TO CONGRESS ON WATER POLLUTION CONTROL MANPOWER DEVELOPMENT AND TRAINING ACTIVITIES.**  
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.  
For primary bibliographic entry see Field 5G.  
W78-10812

**IMPROVED FEDERAL AND STATE PROGRAMS NEEDED TO INSURE THE PURITY AND SAFETY OF DRINKING WATER IN THE UNITED STATES.**  
Comptroller General of the United States, Washington, DC.  
For primary bibliographic entry see Field 5G.  
W78-10813

**WATER POLLUTION ABATEMENT PROGRAM: ASSESSMENT OF FEDERAL AND STATE ENFORCEMENT EFFORTS.**  
Comptroller General of the United States, Washington, DC.  
For primary bibliographic entry see Field 5E.  
W78-10814

**REGULATION FOR TANK VESSELS ENGAGED IN THE CARRIAGE OF OIL IN DOMESTIC TRADE.**  
Coast Guard, Washington, DC. Office of Merchant Safety.  
For primary bibliographic entry see Field 5G.  
W78-10815

**FOREIGN NAVIES AND ENVIRONMENTALISM,**  
Naval Academy, Annapolis, MD.  
R. M. Paone.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A030 904, Price codes: A04 in paper copy, A01 in microfiche. Prepared for the Office of Support Technology, Naval Material Command, Wash., D.C. as Report USNA-EPRD-25, June, 1976. 45 p.

Descriptors: \*Foreign countries, \*Legislation, \*Military aspects, \*Water pollution control, Abatement, Economics, Foreign projects, Foreign research, Foreign waters, Industry, Institutional constraints, Water policy.

The environmental legislation of 15 nations from Latin America, Asia, North America and Europe was studied and placed into a perspective related to the environmental policies of the military of those nations. The study concludes that this environmental legislation has not been as effective as purported. There are several reasons for this situation: (1) lack of implementation measures; (2) insufficient punitive measures; (3) fear of cost of enforcing the environmental laws; (4) greater desire to support industrialization; and (5) inability to perceive pollution abatement as a long term value. These factors, when added to the contemporary character of the national legislation, leads to the conclusion that the effectiveness of the legislation is questionable. Most navies are environmentally minded, although combat readiness, at times involving pollution, is the highest priority. Where a navy has its own Research and Development section, there is a closer interaction between government policy and research and development on the environment. All of the foreign navies have the right to seek exemption from environmental restrictions deemed detrimental to the combat capability of the navy. (Jordan-Florida) W78-10816

**THE INTERNATIONAL LAW OF SCIENTIFIC RESEARCH IN THE OCEANS,**  
Harvard Law School, Cambridge, MA.  
R. R. Baxter.  
Georgia Journal of International and Comparative Law. Vol. 6, No. 1, p 27-39 (1976).

Descriptors: \*International waters, \*Law of the sea, \*Research and development, \*Continental shelf, Oceans, Fisheries, United Nations, Treaties, Internal water, Conferences, Jurisdiction, International law.

Freedom of scientific research of oceans is a major concern of both the United States and the Soviet Union. The author examines the existing legal regime governing scientific research in the seas, noting it will continue to govern if the United Nations Conference on the Law of the Sea (LSC) fails to draw up new treaties. Under present law, scientific research in territorial seas and internal waters is forbidden without permission of the coastal state. In the high seas, there are no restrictions on scientific research in the water column; beyond the limits of the continental shelf; or in the seabed or subsoil. Two polar extremes are discernable at the LSC. As to areas within the economic zone, including the continental shelf, the seabed and subsoil, one view is that research be governed by a consent regime. Such a regime could be managed under the jurisdiction of a coastal state or an international authority. The other faction favors full freedom of scientific research on the continental shelf, seabed and subsoil subject to certain conditions such as notification and sharing of results. All agree that consent is necessary for research in territorial seas and internal water. (Quarles-Florida) W78-10824

**SALINITY MANAGEMENT ALTERNATIVES FOR OIL SHALE WATER SUPPLIES,**  
Colorado State Univ., Fort Collins. Dept. of Economics.  
For primary bibliographic entry see Field 5G.  
W78-10825

**THE LAW OF THE SEA: A TEST OF INTERNATIONAL COOPERATION,**  
Department of State, Washington, DC.  
H. Kissinger.  
Department of State Bulletin, Vol 74, No 1922, p 533-542 (April 26, 1976).

Descriptors: \*International water, \*Law of the Sea, \*Treaties, \*International law, Foreign trade, Political aspects, Economics, Administration, Planning, Foreign countries, Research and development, Jurisdiction.

The Secretary of State outlines United States proposals for the Law of the Sea (LOS) Treaty. The United States was ready to agree to coastal state control of scientific research directly related to the exploration and exploitation of the resources of the economic zone, but insisted that other marine scientific research not be hampered. To promote the fair settlement of disputes involving interpretation of the LOS treaty, the U.S. proposed the establishment of an impartial dispute-settlement mechanism whose findings would be binding upon all signatory states. An International Seabed Resource Authority (ISRA) was proposed to supervise exploration and development of deep seabeds. It was asserted that the ISRA should include: (1) a Council representing the economic concerns of all affected states; (2) a Tribunal to adjudicate powers of the ISRA under the LOS Treaty; and (3) an Assembly of all member states to give policy guidance. To insure nondiscriminatory access to seabed mining sites, the United States proposed that the ISRA should supervise a system of revenue sharing from mining activities for the use of the international community. International institutions could use revenue to assist countries to adjust and diversify and to improve their competitiveness. (Baumbach-Florida) W78-10826

**PROBLEM IDENTIFICATION, LEGAL ASPECTS OF FLOOD CONTROL, ALTERNATIVE CONTROL MEASURES.**  
Pikes Peak Area Council of Governments, Colorado Springs, CO.  
(January, 1976). 92p.

Descriptors: \*Colorado, \*Flood control, \*Runoff, \*Drainage effects, Erosion control, Drainage practices, Urban drainage, Design standards, Coordination, Water management (Applied), Flood plains, Design criteria.

This 1976 report is a result of input from agencies and firms familiar with storm water runoff and associated drainage problems found in the study area near Colorado Springs, Colorado. Each agency and firm was asked to submit a list of 10 problems relating to storm drainage and non-point source pollution, ranking them from most to least frequent. The findings of the survey are presented as general problem classifications with selected comments that are representative of the general problem area. Most frequently mentioned problems were: (1) problems related to erosion and sediment control; (2) problems related to increased runoff, urbanization and development activities; and (3) problems with uniform design criteria and coordination between city and county agencies. The report also includes pertinent state laws, federal laws, drainage laws, and flood plain regulations. An extensive section analyzing alternative control measures contains suggestions for erosion and sediment control and treatment, abatement and disposal of urban runoff. The report is premised on the belief that drainage criteria and design standards must be continually reviewed and

revised to reflect advances in engineering technology. (Stump-Florida)  
W78-10827

**FOURTH CIRCUIT RULES EPA MAY ISSUE PRESUMPTIVELY VALID EFFLUENT LIMITATIONS UNDER SECTION 301 OF THE FWPCA.**  
Environmental Law Reporter, Vol. 6, No. 3, p 10103-10105 (May, 1976).

Descriptors: \*Effluents, \*Federal Water Pollution Control Act, \*Judicial decisions, \*Discharge measurement, Regulation, Administrative agencies, Permits, Industrial wastes, Management, Water quality control, Water pollution sources, Legal aspects.

In 1976, the Fourth Circuit Court of Appeals joined the Third and Seventh Circuits in ruling that the Environmental Protection Agency (EPA) has authority to establish single-number effluent limitations under Section 301 of the Federal Water Pollution Control Act. The ruling continues the judicial momentum for this view, but also further confuses the related question of the form and effect those limitations should have and leaves uncertain the possibility of achieving uniform national discharge standards within each category of industrial polluters. National uniformity of standards was viewed as crucial to the administration and enforcement of the Act; however, the regulatory scheme of the Act is ambiguous and no one has explicit authority to establish effluent limitations. Thus, the judicial decisions giving that power to the EPA are important to the implementation of the Act. The Fourth Circuit approved the reasoning of the other two circuits that the EPA was a reasonable and unobjectionable agency to administer the Act; however the power of the EPA as to particular industrial categories was seen as less than adequate by the court, which noted the need for ultimate Congressional or Supreme Court clarification. (Stump-Florida)  
W78-10828

**CARTER ENVIRONMENTAL MESSAGE STRESSES ADMINISTRATION, ENFORCEMENT.**  
P.S. Ward.  
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1572-1575 (July, 1977).

Descriptors: \*Federal government, Programs, \*Water policy, \*Federal Water Pollution Control Act, Administrative agencies, Adoption of practices, Dredging, Environmental control, Law enforcement, Pollutants, Pollution abatement, Water pollution control, Water pollution sources, Water resources, Wetlands, Decision making.

On May 23, 1977, President Carter delivered an environmental message to Congress. Included were several new legislative initiatives and commitments to submit future legislation, five executive orders, and a variety of policy statements and directives to federal agencies. The President focused attention on three areas of the water pollution program under the Federal Water Pollution Control Act as amended. These were the construction grants program, the 208 program, and the need for further amendments dealing with enforcement. The Environmental Protection Agency was instructed to give highest priority to the development of the 1983 best available technology standards for toxic industrial pollutants and to setting toxic standards under the Safe Water Drinking Act. Carter also issued executive orders initiating a comprehensive review of water resources policy and mandating a cessation of federal support of development in floodplains and wetlands. He supported regulation of dredge spoil disposal in wetlands and requested funding for the purchase of waterfowl habitats. The message also urged the streamlining of the Environmental Impact Statement process, development of legislation to consolidate various environmental grants

programs, and review of environmental coordination legislation to reduce overlapping and conflicting requirements. (White-Florida)  
W78-10829

**EPA CHARTS POLICY FOR DEADLINE ENFORCEMENT.**  
P. J. Picuch.  
Journal Water Pollution Control Federation, Vol. 49, No. 7, p 1569-1571 (July, 1977).

Descriptors: \*Industrial wastes, \*Municipal wastes, \*Water pollution control, \*Federal Water Pollution Control Act, Environmental control, Industries, Penalties (Legal), Pollution abatement, Priorities, Waste water (Pollution), Waste water treatment, Administrative agencies.

Industrial and municipal dischargers that were not in compliance with the water pollution abatement requirements before the July 1, 1977 Federal Water Pollution Control Act deadline face enforcement action from the Environmental Protection Agency (EPA). The author outlines the procedural scope of enforcing the secondary treatment and best practicable technology requirements for municipalities and industries respectively. Regional EPA administrators have been instructed to maintain close coordination with their respective state agencies in order to achieve consistency in filing noncompliance suits and other enforcement actions. The complex EPA enforcement policy regarding industrial dischargers involves the application of a three-pronged strategy. Major dischargers, as classified by the EPA, will be assigned highest priority. Enforcement action will initially concentrate on schedule violations rather than effluent violations. Enforcement priorities will be ranked within the schedule violation category on the basis of potential impact on human health, bad faith efforts toward compliance, and impact of existing discharges. For industrial dischargers, the EPA has established enumerated criteria which, if met, would extend the compliance deadline. EPA's enforcement strategy and priorities for municipal dischargers are also discussed. (White-Florida)  
W78-10830

**CURRENT STATUS OF THE WASHINGTON COASTAL ZONE MANAGEMENT PROGRAM AMENDMENT.**  
Washington State Dept. of Ecology, Olympia. Shoreline Div.  
D. R. Mack.

In: Shorelines Management '77 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle, Sea Grant Program, Division of Marine Resources, p 148-152.

Descriptors: \*Washington, \*Coastal plains, \*Environmental effects, \*Land management, \*Coasts, Management, Regulation, Administrative agencies, Legislation, Federal government, Economic impact, Oil, Land use, Municipal water, Solid wastes, Transportation, Governmental interrelations, Water quality, State governments, Zoning, Administrative decisions.

The state of Washington is seeking to amend its federally approved coastal zone management program. The amendment procedures are constantly evolving as new issues arise. The process involves a high level of public participation. This summary reflects the current status of the amendment and traces its history. The amendment requires the same review and approval procedures as the initial program. This includes public hearings, federal agency review and compliance with the National Environmental Policy Act. Further requirements include: (1) a formal request for an amendment; (2) a description of the change; (3) justification showing that the proposal complies with federal regulations; (4) evidence of public notice; and (5) analysis of environmental impacts. The proposed

amendment calls for deletion of a policy statement favoring the siting of a single, major crude petroleum transfer facility in Washington's coastal zone. The amendment would allow the state to keep all options open and allow a more thorough analysis of the issue. The article contains a short discussion of the analysis of the environmental impact of the amendment. A decision on the amendment should be available in June of 1978. (Quarles-Florida)  
W78-10831

**EMERGING PATTERNS OF DECISIONS (THE APPLICATION OF POLICY IN THE ADMINISTRATION OF THE SHORELINE MANAGEMENT ACT IN WASHINGTON).**  
Shorelines Hearings Board, Lacey, WA.  
C. Smith.

In: Shorelines Management '77 Performance and Prospects, Conference Proceedings, September 22-23, 1977, University of Washington, Seattle, Sea Grant Program, Division of Marine Resources, p 111-118.

Descriptors: \*Permits, \*Washington, \*Land management, \*Land development, \*Shores, Legislation, Regulation, State governments, Local governments, Water pollution control, Beaches, Shore protection, Coasts, Public access, Aesthetics, Landfills, Decision making, Judicial decisions, Administration, Water policy.

The Shoreline Management Act (SMA) is important to those who develop or regulate development of Washington's shorelines. The main regulatory device employed by the SMA has proven to be the substantial development permit. By examining some cases where local decisions on permit applications have been appealed to the Shorelines Hearing Board (SHB), the author analyzes the application of the policies and procedures of the SMA. The history of the SHB is examined as well as its jurisdiction under the SMA. The procedures required for requests for review by the SHB are set forth along with the actions that the SHB may take. The conduct of the formal hearings, the standard of review required, the content of orders issued by the SHB, and appeals procedure from the SHB's orders are explained. The SHB's primary responsibility, in applying the SMA, is to evaluate a substantial development proposal in terms of the policies and procedures of the SMA. To illustrate the process, the author analyzes some typical SHB decisions involving fills, aesthetics and public access. (Quarles-Florida)  
W78-10832

**INTERGOVERNMENTAL CONFLICT IN LAND USE PLANNING: THE CALIFORNIA COASTAL ZONE CONSERVATION COMMISSION V. THE LOCAL REDEVELOPMENT AGENCIES.**  
A. M. Kirin.  
Beverly Hills Bar Journal, Vol. 11, No. 3, p 20-29 (May-June, 1977).

Descriptors: \*California, \*Coasts, \*Area redevelopment, \*Inter-agency cooperation, \*Permits, Land development, Project planning, Governmental interrelations, Future planning (Projected), Land use, Planning, Administrative agencies, State governments, Legal aspects, Land management, Legislation, Local governments, Regional planning, Comprehensive planning, Judicial decisions, Common law.

In 1972, California enacted the California Coastal Zone Initiative. The objective of the Initiative was the protection and restoration of coastal zone resources. This article analyzes the political and legal basis for the ensuing conflict between the local redevelopment agencies with existing projects and the newly established coastal commissions. Local agencies had to choose between applying for permits under the new law or seeking exemption under the theory of vested rights. Controversy arose over exemption and permit requests because different results were reached at

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the local and state levels. The controversy climaxed in 1973 when the California supreme court held that exemptions based on vested rights did not extend to redevelopment activities undertaken by private developers. The court also viewed redevelopment projects as a series of smaller enterprises each requiring a separate exemption or permit request. The author makes the following recommendations to resolve the tension between the state and local interests: (1) that all activities, public and private, taken pursuant to a redevelopment plan be classified as a single project and (2) that a project plan be considered as a whole for initial permit purposes. (Malmad-Florida)

W78-10833

#### EFFLUENT CHARGES AS AN ALTERNATIVE TO REGULATIONS,

S. J. Hadeed.

Journal Water Pollution Control Federation, Vol. 49, No. 4, p 534-36, April, 1977.

Descriptors: \*Pollution taxes(Charges), \*Water pollution control, \*Regulation, \*Pollution abatement, Water pollution sources, Water law, Environmental control, Cost-benefit theory, Costs, Taxes, Waste water disposal, Effluents, Law enforcement, Industrial plants, Industrial wastes, Water pollution, Penalties(Legal).

The Water Act, the regulatory approach to pollution control, has encouraged many industrial point sources polluters to reduce their pollutant levels to within the limits specified by effluent guidelines. However, a significant number of dischargers have failed in their attempts to comply with the provisions of the Water Act. To remedy this situation a proposed amendment, designed to supplement the regulatory approach by adopting a system of effluent taxes, was recently submitted to Congress by the Environmental Protection Agency. The amendment would add a new section entitled 'Non-Compliance Fee' to the Water Act. This amendment would authorize the imposition of a penalty upon noncomplying point sources. Opponents of the effluent tax system believe that the problem of determining pollution levels, assessing equitable fines, and distributing higher costs to the consumer will hinder the system's effectiveness. Advocates of the new fee claim that it will improve the efficiency of existing enforcement methods as well as foster compliance with the Water Act by making investment in pollution control facilities at least as financially attractive to industries as noncompliance. In addition, the amendment will end the inequitable result of permitting non-complying sources to gain competitive advantage over sources which have complied. (Curtis-Florida)

W78-10834

#### FLORIDA'S AREA OF CRITICAL STATE CONCERN: AN UPDATE,

Florida Bureau of Land and Water Management, Tallahassee. Div. of State Planning.

S. Fox.

Florida Environmental and Urban Issues, Vol. 5, No. 4, p 6-10 (April, 1978).

Descriptors: \*Florida, \*Environmental control, \*Land management, \*Water resources development, Legislation, Regulation, Land use, Regional development, Watershed management, Recharge, Wetlands, Planning.

Florida's Environmental Land and Water Management Act of 1972 (FLWMA) authorizes the designation of Areas of Critical State Concern (ACSC) and the review of developments of regional impact. The process, criteria, and consequences of designation of an ACSC are outlined. Once an ACSC has been designated, affected local governments have six months in which to submit acceptable land development regulations. Florida's first ACSC was the Big Cypress Swamp,

a part of the Everglades National Park watershed. The state has attempted to reverse the water loss there caused by land speculators and farmers who dug canals to produce more dry land. The second ACSC was the Green Swamp, a major recharge area for the Floridan Aquifer. The Green Swamp's wetlands are the headwaters for five rivers. The third ACSC designated was the Florida Keys which now have the most comprehensive and complex regulations. The ACSC program and a new alternative resource management and planning program developed for the Appalachicola River Basin are analyzed. The author notes that the ACSC portion of the FLWMA has been declared unconstitutional by a lower court. The decision is being reviewed by the state Supreme Court. (Hooftman-Florida)

W78-10835

#### THE SETTLEMENT OF DISPUTES AND THE LAW OF THE SEA,

Pittsburgh Univ., PA.

D. S. Cheever.

Marine Policy Reports, Sea Grant College Program, College of Marine Studies, University of Delaware, Vol. 1, No. 5, (February, 1978), 4 p.

Descriptors: \*United Nations, \*Conferences, \*Law of the Sea, \*International law, Negotiations, International waters, Treaties, Regulation, Beds under water, Continental shelf, Natural resources, Exploitation.

One result of the Third United Nations Conference on the Law of the Sea (Conference) was the outlining of procedures for dispute settlement specified in the informal Composite Negotiating Text (ICNT). Most governments attending agree that a binding dispute settlement procedure is indispensable for any comprehensive ocean treaty or regulatory regime. The author traces the historical development of binding dispute procedures and changes in the political-legal regime of freedom of the high seas. Conflicting interests and issues concerning jurisdiction over marine and seabed resources, pollution control, transit passage, and the 200-mile exclusive zone are discussed. To handle ocean resource exploitation disputes, the ICNT provides for a Sea Bed Dispute Chamber as part of a Law of the Sea Tribunal (LST) having jurisdiction over disputes arising between specified parties. The author details the procedures and composition of the LST and discusses three alternative forums for settling disputes: (1) the International Court of Justice; (2) traditional arbitration; and (3) appointment of experts to special arbitral tribunals. The author also discusses the scope and limits of the ICNT dispute settlement system which is particularly limited in the management of coastal zone fisheries. (Hooftman-Florida)

W78-10836

#### TROUBLE AHEAD FOR CLEAN WATER,

Natural Resources Defense Council, New York.

M. Reisner.

NRDC Newsletter, Vol. 6, Issue 4, p 7-10 (July-August, 1977).

Descriptors: \*Federal Water Pollution Control Act, \*Water pollution control, \*Water pollution sources, \*Hudson River, Water pollution effects, Pollution abatement, Effluents, Navigable waters, Toxins, Permits, Administrative agency

The Natural Resources Defense Council's Project on Clean Water (Project) was established shortly after passage of the Federal Water Pollution Control Act of 1972 (FWPCA). To illustrate the alleged failure of the federal water pollution control effort, the author traces the path of the Hudson River from its tributary sources to where it empties into the Atlantic Ocean. Sources and types of pollutants which enter the river are identified and related to specific provisions of the FWPCA designed to remedy or ameliorate the problem. Sewage entering the river could be treated through

implementation of the sewage treatment construction program. Other sections of the FWPCA were written to: (1) restrict the dumping of dredged or fill material into navigable waters; (2) control runoff of organic nutrients, chemical poisons, and sediments from the land; and (3) regulate toxic and hazardous pollutants. FWPCA sections concerning implementation of pollution control technology, state and federal permits system, and enforcement are also identified. Focusing on the problems of toxic pollutants, saving wetlands, enforcement and runoff, the author discusses the interaction of the legislative and litigation efforts of the Project governmental agencies, and private industry. The author advocates vigorous citizen efforts to prevent weakening of the FWPCA. (Hooftman-Florida)

W78-10837

#### EVOLUTION IN THE BRITISH INSTITUTIONAL FRAMEWORK FOR WATER MANAGEMENT,

Victoria Univ. (British Columbia). Dept. of Geography.

W. R. D. Sewell, and L. R. Barr.

Natural Resources Journal, University of New Mexico, School of Law, Vol. 17, No. 3, p 395-413 (July, 1977).

Descriptors: \*Droughts, \*Water resources development, \*Foreign countries, \*Management, Rationing(Water), Water shortage, Regulation, Administration, Planning, Alternative water use, Groundwater resources, Research and development.

The authors note that crisis often plays an important role in stimulating change in resources management institutions. They analyze the role of the British drought in the summer of 1976 as an impetus to change. The major features of British water resource protection were institutionalized under the 1963 Water Resources Act and the 1973 Water Act. Relatively sweeping reforms were accomplished with the 1963 Act, specifically by the establishment of a Water Resources Board. Through encouragement and facilitation of research and long-range planning, and coordination of major water management agencies, the Board was to provide a national perspective in water management. Although that Board was abolished by the 1973 Act, its functions are essentially carried on by the National Water Council. Deficiencies, such as too large a number of independent water management units, were remedied by the 1973 Act. The 1976 drought put pressure on policy-makers to initiate further changes. It led to a revival of interest in major reservoir and water diversion schemes, as well as consideration of alternatives such as recycling, groundwater development and rationing. (Stump-Florida)

W78-10838

#### THE ROLE OF INTERSTATE COMMISSIONS IN GROUNDWATER PROTECTION—THE SUSQUEHANNA RIVER BASIN COMMISSION PERSPECTIVE,

Susquehanna River Basin Commission, Mechanicsburg, PA.

For primary bibliographic entry see Field 5G.

W78-10839

#### SURFACE WATER: TEXAS GULF COAST ALTERNATIVE TO SUBSIDENCE,

Harris-Galveston Coastal Subsidence District, Houston, TX.

J. E. DeBarry.

Water and Sewage Works, Vol. 124, No. 7, p 52-53 (July, 1977).

Descriptors: \*Water management(Applied), \*Surface-groundwater relationships, \*Subsidence, \*Texas, Groundwater availability, Groundwater basins, Water resources development, Water supply, Water wells, Permits, Regulation, Groundwater resources.



An acceleration of subsidence, the loss of land surface elevation, due to concentrated groundwater pumping prompted the creation in May, 1975, of the Harris-Galveston Coastal Subsidence District. The two-county special district was created for the purpose of regulating groundwater pumping and promoting the use of surface water in order to end subsidence. This article reviews the progress of the district in its first two years. One of the district's main regulatory functions is the issuance of well permits. In considering permit applications, the district first determines whether or not there is an available source of surface water. With the Trinity, San Jacinto and Brazos River systems as the primary sources of surface water in the area, a total of 1195 MGD is available, which is considered adequate to meet the area's rapidly growing water demands well into the next century. In testimony given at a public hearing on the district's progress, a United States Geological Survey indicated that significant increases in groundwater levels were recorded in areas where significant conversion to surface water rise had taken place. Thus, the outlook for this two-county area is positive. (Stump-Florida)

W78-10840

#### KLEPPE CONDITIONALLY DECLARES NEW RIVER A SCENIC RIVER.

Environmental Law Reporter, Vol 6, No 4, p 10077-10080 (April, 1976).

Descriptors: \*Wild River Act, \*North Carolina, \*Pumped storage, \*Hydroelectric project licensing, Hydroelectric plants, Hydroelectric power, Water supply, Water storage, Federal Water Pollution Control Act, Federal Power Act, Drawdown, Permits.

In the first administrative design of this kind, Secretary of the Interior Thomas Kleppe granted the request of the state of North Carolina to include the New River among those designated 'wild and scenic rivers'. North Carolina's action was an attempt to prohibit construction of a large pumped-storage hydroelectric facility, called the Blue Ridge Project, by the Appalachian Power Company under a license granted by the Federal Power Commission. The Wild and Scenic Rivers Act prohibits such construction on those rivers included in the national wild and scenic river system. However, the designation was granted conditionally; if the FPC licensing of the Blue Ridge Project survives pending judicial review in the District of Columbia Circuit Court, that license will take precedence, and the construction will be allowed. This article discusses North Carolina's allegations that the real motivation behind the Blue Ridge Project is to augment streamflow for water quality control, which is in violation of the Federal Water Pollution Control Act, and identifies several factors the Court should consider in balancing the interests that favor flooding the river and those that favor preserving it. (Stump-Florida)

W78-10841

#### CALIFORNIA ISSUES STRONG COASTAL PLAN.

Environmental Law Reporter, Vol 6, No 4, p 10083-10086 (April, 1976).

Descriptors: \*California, \*Water resources, \*Planning, \*Regional development, Comprehensive planning, Legislation, Management, Beaches, Recreation, Coasts, Urban land use, Zoning.

The 1976 California legislature had the task of debating the proposed California Coastal Plan. The author of this article felt that the outcome would have a major impact on not only the California coast, but also on the national destiny of other comprehensive resource management plans. In response to the increasing population growth and density near the California coasts, the plan proposed quality development of the coastal area, integrating the preservation, enhancement and

restoration of natural and man-made coastal resources. Additionally the plan recommended granting priority to public and coastal-dependent resource uses over private and non-coastal dependent uses. This article discusses specific plan provisions for energy and transportation, beach access and recreation, marine environment, and land environment and development. The California legislature had to consider several implementing bills, none of which adopted the Coastal Plan verbatim. This plan was one of the most comprehensive land use plans then developed in the United States, and was not without its detractors. With its twin objectives of protection of natural resources and quality development, the author concludes the plan's adoption or rejection will influence other innovative plans like it. (Stump-Florida)

W78-10842

#### WATER ACT'S OIL SPILL NOTIFICATION RULE SURVIVES CONSTITUTIONAL CHALLENGES.

Environmental Law Reporter, Vol 6, No 1, p 10011-10014 (January, 1976).

Descriptors: \*Law enforcement, \*Federal Water Pollution Control Act, \*Oil spills, \*Penalties(Legal), Oil pollution, Disasters, Water pollution, Regulation, Water law, Water pollution sources, Judicial decisions, Water quality control.

The fact that neither ecosystems nor pollutants respect state lines substantially explains the growing role of the federal government in pollution control. Although there have been serious challenges to the authority of the Environmental Protection Agency to administer some pollution control programs, implementation of the far-reaching Federal Water Pollution Control Act Amendments of 1972 has not been the subject of many attacks. However, some objections have been made to the statute's strict oil spill enforcement scheme, particularly one of its self-reporting requirements. To satisfy this requirement, and to insure prompt clean up, whoever spills harmful quantities of oil or other hazardous substances must immediately notify authorities of that fact. Both failure to notify and failure to do so promptly are criminal offenses. Although an Act provision prohibits the use of information contained in the required notification in a criminal prosecution of the individual responsible for the spill, many litigants have complained that the requirement violates their privilege against self-incrimination. This article analogizes this requirement to the vehicular hit-and-run self-reporting rule and predicts that it will be able to withstand strict constitutional scrutiny if challenged. (Stump-Florida)

W78-10843

#### FEDERAL PARTICIPATION IN SHORE, HURRICANE, AND TIDAL AND LAKE FLOOD PROTECTION.

Department of the Army, Washington, DC. Federal Register, Vol 43, No 14, p 3048-3052 (January 20, 1978).

Descriptors: \*Shores, \*Flood protection, \*Water policy, \*Administrative agencies, Flood control, Hurricanes, Lakes, Beach erosion, Federal government, Shore protection, Planning, Cost sharing.

This proposed regulation prescribes the policies to be used by the Army Corps of Engineers (COE) in recommending and providing measures for shore, hurricane, and tidal and lake flood protection. COE beach control is authorized by identified federal acts providing for: cooperative studies with city, county, and state agencies; federal aid for construction of improvements and protection of publicly owned shores, and for privately owned shores where the public benefits; and federal funding of construction, studies, and reimbursement of work done by local interests. Federal acts

authorizing hurricane, tidal and lake flood protection, and related legislative authorizations are summarized. Eligibility criteria for COE participation are discussed in terms of geographic area, beach erosion, shore categories, public use, public shores with limitations, and improvements for recreation. The impact on COE participation of user fees, public parking, access, and beach use by private organizations is discussed. COE responsibilities in serving federal interests are identified for various phases of project development, such as: studies; construction; maintenance; periodic nourishment; and working for other federal agencies. Plan formulation and evaluation criteria are listed. Federal cost sharing and local cooperation requirements are outlined. (Hoofman-Florida)

W78-10844

#### SURFACE MINING RECLAMATION AND ENFORCEMENT PROVISIONS.

Office of Surface Mining, Reclamation and Enforcement, Washington, DC. Federal Register, Vol 43, No 39, p 8090-8093 (February 27, 1978).

Descriptors: \*Coal mine wastes, \*Design criteria, \*Water pollution control, \*Mining, Environmental engineering, Regulation, Administrative agencies, Settling basins, Diversion structures, Surface runoff, Water quality control, Effluents.

Pursuant to the Surface Mining Control and Reclamation Act of 1972, the Secretary of the Interior has published initial environmental protection regulations applicable to all coal-mining operations on lands regulated by the states until the state has an approved regulatory program. These interim rules modify the initial regulations by amending the design criteria for sedimentation ponds and temporary diversion structures for surface coal-mining operations. The filing deadlines for submission of schedules for reconstruction of existing sedimentation ponds and related pre-existing non-conforming structures are extended. These rules resulted from consideration of state, industry, and public interest representatives' comments; and from Interior Department and Environmental Protection Agency observation of mining operations. Primary technical literature is listed. These rules delete the minimum requirement that sedimentation ponds provide one square foot for each fifty gallons of inflow but do require consideration of sedimentation pond surface area in pond design to achieve effluent limitations. These rules clarify sediment storage volume requirements and require sedimentation pond design to provide a 24-hour detention time for runoff unless a lower detention time is approved. These rules also modify the requirements governing temporary diversion structures and distinguish small depressions. (Hoofman-Florida)

W78-10845

#### FEDERAL WATER POLLUTION CONTROL ACT ENFORCEMENT FROM THE DISCHARGER'S PERSPECTIVE: THE USES AND ABUSES OF DISCRETION.

N. F. Tennille, Jr. Environmental Law Reporter, Vol 7, No 12, p 50091-99, December, 1977.

Descriptors: \*Permits, \*Administrative agencies, \*Federal Water Pollution Control Act, \*Water pollution control, \*Administrative decisions, Discharge(Water), Legal aspects, Legislation, Regulation, Waste disposal, Environmental effects, Decision-making, Pollution abatement, Water quality control, Supervisory control(Power), Water pollution sources, Water law.

A central issue in the evaluation of federal and state environmental regulatory mechanisms is the degree of discretion which should be vested in the regulatory authorities to set and enforce environmental standards. Under the Federal Water Pollu-

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tion Control Act (FWPCA), the Environmental Protection Agency (EPA) and the states have broad power to regulate pollution discharges. The FWPCA provides the Administrator of the EPA only general guidelines for setting standards, writing permits, and enforcing permits. Courts typically defer to the administrator when his actions are challenged, creating an obstacle to dischargers who question standards or permit requirements. Additionally, the states have considerable discretion in setting substantive effluent standards which will be enforced against the discharger. Such state standards are integrated with federal standards at the permit-writing stage. The National Pollutant Discharge Elimination System (NPDES) permitting process is also subject to vast regulatory discretion. Since NPDES permits are issued on a regional level, this can result in uneven permit requirements for different areas of the country. The author concludes that a consistent but flexible enforcement policy must be developed and provided to the EPA by Congress. (Rule-Florida) W78-10846

#### OCEAN DUMPING REVISITED: NEW STATUTORY DEADLINE MAY NOT STOP SEA DISPOSAL OF SEWAGE SLUDGE.

For primary bibliographic entry see Field 5G. W78-10847

#### THE MOVE TO AMEND §404 OF FWPCA: HOUSE PASSES BILL LIMITING FEDERAL AUTHORITY OVER DREDGE-AND-FILL ACTIVITIES.

Environmental Law Reporter, Vol 7, No 5, p 10082-10084 (May, 1977).

Descriptors: \*Federal Water Pollution Control Act, \*Rivers and Harbors Act, \*Navigable waters, \*Dredging, Legislation, Permits, Water resources development, Governmental interrelations, Navigable rivers, Wetlands, Water pollution control, Water pollution sources.

In an effort to restrict regulatory power over dredge-and-fill activities, the House of Representatives passed a bill in April, 1977, which narrows the broad definition of 'navigable waters' set forth in Section 502(7) of the Federal Water Pollution Control Act. The House bill, H.R. 3199, renewed several funding authorizations under the Act, but is also designed to limit federal dredge-and-fill jurisdiction under Section 404 of the Act. This bill would remove as much as 98 percent of the nation's stream miles and 80 percent of its wetland areas from federal control. The bill consequently would open loopholes in the Act, removing the permit requirement for pollutant discharge into non-commercially navigable waters or adjacent wetlands. The bill may also foster inadequate state regulatory efforts because it breaches the basic assumptions of the interrelated character of water systems. Thus, it may also serve to open the way for comparable limitations on the scope of federal jurisdiction over point-source discharges and consequently cut out the heart of the national water pollution control problem. (Stump-Florida) W78-10848

#### AN EXAMINATION OF THE LAW OF WATER BOUNDARIES AND ACCRETIONS IN MANITOBA.

Tallin Knitjansson, Winnipeg (Manitoba). B. N. Johansson. Manitoba Law Journal, Vol 8, No 1, p 403-416 (1977).

Descriptors: \*Ownership of beds, \*Canada, \*Accretion (Legal aspects), \*Riparian rights, Water law, Banks, Navigable waters, Recreation, Tidal waters, High water mark, Nonnavigable waters, Lakes.

The increased pressure on availability of land, especially for recreational use, naturally raises the

value of waterfront property and underscores the need for a uniform method of determining property boundaries. This article is an analysis of the methods used in Manitoba. The Canadian laws are distinguished from English common law, with a major difference being the standards for determining boundaries in nontidal waters. Manitoba law differentiates between navigable and non-navigable non-tidal waters. The boundary of lands bordering navigable non-tidal waters is rebuttably presumed to extend only to the ordinary high water mark, while on non-navigable non-tidal waters it is rebuttably presumed to extend to the middle of the stream. However, the statutory law of Manitoba does not clearly follow these presumptions, creating a conflict between standards for boundary determination which has not yet been resolved. The article also deals with the additional problems of accretion, dereliction and determining boundaries on newly deposited or removed lands. The doctrine of accretion in Manitoba applies to tidal and non-tidal, navigable and non-navigable rivers, and also to the sea. (Stump-Florida) W78-10849

#### THE PUBLIC TRUST DOCTRINE AND OWNERSHIP OF FLORIDA'S NAVIGABLE LAKES.

D. L. Malloy. University of Florida Law Review, Vol 29, No 4, p 730-751 (Summer, 1977).

Descriptors: \*Florida, \*Lake beds, \*Ownership of beds, \*Competing uses, Recreation, Inland waterways, Navigable waters, Non-navigable waters, Riparian rights, Public access, Water resources development, Legislation.

Florida adheres to the common law public trust doctrine which requires that the state holds legal title to the beds of navigable lakes while the public owns the beneficial title. The continuing controversy over the management and control of the lakes has been intensified by economic development, new environmental concerns and increasingly crowded conditions. In response to these pressures, Florida courts have relied on three theories to exempt land from the public trust for purposes of private development. These are: the apparent intent of certain legislation; equitable and legal estoppel; and application of the Marketable Record Title Act to quiet title in favor of private claimants. In the most recent case considering these questions, *Odom v. Deltona Corporation*, the Florida Supreme Court used all three arguments to avoid the application of the public trust doctrine to inland waters, but did not rely on any one, perhaps in a recognition of each individual argument's weaknesses and a belief that the whole is greater than the sum of its parts. This commentary also considers alternative means to protect the public interest in trust lands. (Stump-Florida) W78-10850

#### EPA AUTHORITY AND RESPONSIBILITY UNDER THE COASTAL ZONE MANAGEMENT ACT OF 1972.

Environmental Protection Agency, San Francisco, CA. Region IX. D. R. Andrews. Natural Resources Lawyer, Vol 10, No 2, p 249-255 (1977).

Descriptors: \*Coasts, \*Land management, \*Water management (Applied), \*Federal Water Pollution Control Act, Water control, Water quality, Water quality control, Water quality standards, Water policy, Regulation, Legislation, Water resources, Water resources development, Local governments, State governments, Federal government.

The 1972 Coastal Zone Management Act (CZMA) is a unique federal land use law. It is a pioneering effort in collaborative planning among the federal government, the states, and local communities for

use of the land. All thirty coastal states and three of the four territories are participating in the voluntary program established by the law. The goal of the program is to encourage the states to balance needs and make deliberate choices among myriad claims on coastal resources. The basic role of the Environmental Protection Agency (EPA) under the CZMA is to participate in the development of management plans and to insist that the Secretary of Commerce not approve a management plan unless the EPA's views have been 'adequately considered' by the state. One of the EPA's major responsibilities is to issue permits for activities which affect the coastal zone. However, permits are to be issued only if the activity is consistent with approved state management plan. Since the water quality control requirements of the Federal Water Pollution Control Act are the primary control mechanisms in the coastal zones, these standards may not be altered by the states under the CZMA planning authority. (Stump-Florida) W78-10851

#### AN OVERVIEW OF CHANGES OCCURRING IN THE LAW OF THE SEA—IMPLICATIONS FOR FEDERAL-STATE RELATIONS.

Krueger, Nossaman and Marsh, Los Angeles, CA. R. B. Krueger. Natural Resources Lawyer, Vol 10, No 2, p 225-235 (1977).

Descriptors: \*Law of the sea, \*Oceans, \*Submerged Lands Act, \*Federal-state water rights conflicts, International law, Coasts, Inland waterways, Continental shelf, Harbors, Treaties, International waters, Governmental interrelations.

Recent changes in federal law that have given coastal states jurisdiction over federal activities and land involve adjustments in the organic structure created by the Submerged Lands Act of 1953. Specifically, under the Deepwater Ports Act of 1974 the Secretary of Transportation is not permitted to issue a license for the construction of a deepwater port unless the governor(s) of the adjacent state of states approves. Also, through the Outer Continental Shelf Lands Act, advisory liaison has been established between the federal government and the coastal states. The indirect influence of the states through the political process has been significant and influential. Moreover, legislation was introduced in 1977 which would increase the role of the states in federal offshore oil development. The author also reviews the work of the United Nations since 1967 on the whole spectrum of law of the sea issues and concludes that it is likely that any new international ocean treaties will be incorporated into our domestic law and will profoundly influence the relationships between the federal and state governments. (Stump-Florida) W78-10852

#### THE CONTINUING OCEAN DEBATE.

J. C. Fine. Sea Frontiers, Vol. 22, No. 2, p. 77-85 (March-April, 1976). 1 fig.

Descriptors: \*Conferences, \*Law of the sea, \*Oceans, \*United Nations, Coasts, International law, Jurisdiction, Natural resources, Navigation, Ownership of beds, Political aspects, Regulation.

Nations participating in the third international Law of the Sea Conference in Caracas, Venezuela were unable to agree on the substance of a treaty governing proprietary rights in the world's oceans. The author examines the major issues in controversy and explores the various options available to Conference participants. The basic issues are whether the oceans' resources should belong to any nation with sufficiently advanced technology to obtain them; whether coastal states can extend their boundaries and jurisdiction into the sea at will, thereby excluding oceanic resources from

non-coastal states should be shared. The author taken by Continental seas zone, fisheries, pollution, and so for the continuing seabed mining marine pollution observation on the uses of environment. (V W78-10853

CASES ON I. K. R. Simmons. (Cases on I. Publications.

Descriptors: \*Ships, \*J. Navigation, waters, Law review.

A representative 1800 to 1860 included are but are often presented in cases are some decisions. The editor writes. The introduction subject division: (1) Territorial; (2) Fisheries; (3) Sea; and (4) conclusion based on intrinsic importance was a trine or line had great in year 1800 series because admiralty law W78-10854

CASES ON K. R. Simmons. (Cases on Publication.

Descriptor: \*Ships, \*J. Navigation, waters, Law review.

A representative 1861 to 1890 of casebooks were chosen upon their maritime continue concerning jurisdiction at sea, just current jurisdiction the flag a jurisdiction emergency jurisdiction foreign-over distinction ligent on Each case the author divisions. W78-10855

non-coastal states; and whether ocean resources should be shared under an international agreement. The author examines the variety of positions taken by Conference delegates with respect to territorial seas and straits, the 200-mile economic zone, fisheries, international seabeds, marine pollution, and scientific research. Reasons are cited for the continued impasse on controlling deep-seabed mining, dumping, and other forms of marine pollution. The author concludes with the observation that a binding international agreement on the uses of the oceans is essential to the preservation of a productive and healthy oceanic environment. (White-Florida)

W78-10853

#### CASES ON LAW OF THE SEA, VOLUME I, K. R. Simmonds.

(Cases on Law of the Sea, Volume I) Oceana Publications, Dobbs Ferry, N.Y., 1976, 470 p.

Descriptors: \*Law of the sea, \*International law, \*Ships, \*Judicial decisions, Legal aspects, Navigation, Oceans, Transportation, International waters, Law enforcement, Penalties (Legal), Legal review.

A representative sampling of maritime cases from 1800 to 1860 is presented in this volume. The cases included are drawn from established law reports, but are often scattered and hard to find. They are presented in chronological order. Most of the cases are either English or American, although some decisions from other maritime nations are included. Preceding each case is an introduction by the editor which refers the reader to related cases. The introduction also lists the case in a particular subject division. The subject divisions used are: (1) Territorial Sea; (2) Archipelagoes; (3) Bays and Gulfs; (4) Islands; (5) Straits; (6) Fishery Rights; (7) Fishery Limits; (8) Contiguous Zone; (9) High Seas; and (10) Ships. Cases were selected for inclusion based on the following criteria: (1) the intrinsic importance of the decision; (2) whether the case was a turning point in the evolution of a doctrine or line of authority; or (3) whether the case had great influence on subsequent decisions. The year 1800 was chosen as the starting point for the series because a resurgence in Anglo-American admiralty law began then. (Malefatto-Florida)

W78-10854

#### CASES ON LAW OF THE SEA, VOLUME II, K. R. Simmonds.

(Cases on Law of the Sea, Volume II) Oceana Publications, Dobbs Ferry, N.Y., 1976, 432 p.

Descriptors: \*Law of the sea, \*International law, \*Ships, \*Judicial decisions, Legal aspects, Navigation, Oceans, Transportation, International waters, Law enforcement, Penalties (Legal), Legal review.

A representative sampling of maritime cases from 1861 to 1890 is presented in Volume II. of a series of casebooks dealing with the law of the sea. Cases were chosen for inclusion in this volume based upon their intrinsic importance to the evolving maritime doctrines of the era. The cases reported continue to reflect the uncertainty of this period concerning the nature and character of the jurisdiction exercised by coastal states over territorial seas, gulfs, and bays. Problems relating to concurrent jurisdiction between the coastal states and the flag state and the exemptions from local jurisdiction are examined. The cases illustrate the emergence of such major new areas of controversy as the function and extent of sovereign jurisdictional communities as they applied to foreign-owned public or commercial vessels. The distinctions drawn between piratical acts and belligerent or insurgent activities are also discussed. Each case is preceded by a short introduction by the author and is categorized in one of ten subject divisions. (Malefatto-Florida)

W78-10855

#### REVIEW OF PROJECTS AFFECTING THE EDWARDS UNDERGROUND RESERVOIR, A DESIGNATED SOLE SOURCE AQUIFER IN THE SAN ANTONIO, TEXAS AREA.

Environmental Protection Agency, Washington, DC.

Federal Register, Vol. 42, No. 189, p. 51574-79, September 29, 1977.

Descriptors: \*Aquifers, \*Project planning, \*Government finance, \*Water supply development, \*Water quality control, Groundwater, Water sources, Reservoirs, Aquifer management, Administration, Planning, Project purposes, Project benefits, Projects, Competing uses, Alternative planning, Grants, Loans, Aquatic environment, Water quality, Water policy, Water supply.

The Edward's Underground Reservoir Texas area, had been designated a 'sole or principal source aquifer' under the Safe Drinking Water Act. The Act provided that 'no commitment of federal financial assistance shall be made to a project which the Administrator determines may contaminate an aquifer...so as to create a significant hazard to public health.' On April 26, 1976, the Environmental Protection Agency (EPA) held a public hearing in San Antonio, Texas, to hear the views of interested persons on the interim guidelines for project review. Several of the comments resulted in changes in the interim regulations including: an expanded definition of 'significant hazard to public health'; the deletion of the work 'major' from 'major projects' to fulfill the EPA intent to review any federally aided project; the clarification of 'commitment' to mean a 'written' agreement; and the simplification of petition information requirements. The EPA also concluded that several comments were adequately covered by the interim regulations. These comments questioned: appeal procedures; notice for public review; EPA reliance on state control; consideration of public benefit; and, the procedure for resubmission of redesigned projects. (Kastner-Florida)

W78-10856

#### DELIMITATION OF MARINE AND SUBMARINE AREAS: THE GULF OF VENEZUELA, Clemson Univ., SC. Dept. of Political Science.

M. J. Martz.

Lawyer of the Americas, Vol. 8, No. 2, p. 301-317 (June, 1977).

Descriptors: \*Law of the Sea, \*Continental shelf, \*South America, \*Boundary disputes, Treaties, Ownership of beds, Oil, Natural resources, Exploitation, International waters, Political aspects, International law.

There has been an ongoing border dispute between Venezuela and Colombia since the early 1800's. In recent years the dispute has centered on marine and submarine areas of the Gulf of Venezuela. The major reason for dispute is the presence of petroleum and other minerals in the Gulf. Venezuela notes that prior to 1833 the entire Gulf was surrounded by its territory and that Colombia paid little attention to the area until the 1960's when oil exploitation became feasible. Colombia maintains that the Gulf should be divided by equidistant lines with the adjacent state controlling the territorial sea and continental shelf closest to its coast. The 1958 Geneva Convention on the Continental Shelf endorsed this method of delimitation. Venezuela contends that the corving coast along the Gulf would disproportionately favor Colombia, and relies upon the 1969 North Sea Cases decided by the International Court of Justice to support their view. The court in those cases rejected the use of one method of delimitation in all circumstances, and held that the standard should guarantee an equitable outcome. Current negotiations have not been successful in arriving at a mutually acceptable solution, despite cordial relations between the two nations. (Malefatto-Florida)

W78-10857

#### NEBRASKA WELL-INTERFERENCE PROBLEMS--A PROPOSAL.

P. D. Hietbrink.

Nebraska Law Review, Vol. 56, No. 3, p. 565-598 (1977).

Descriptors: \*Well regulations, \*Nebraska, \*Water rights, \*Water levels, Legislation, Water wells, Groundwater, Equitable apportionment, Water level fluctuations, Groundwater availability, Overlying proprietor, Competing uses.

As use of Nebraska's groundwater resources increases, so do instances of well-interference among adjoining users. Although a variety of statutes pertaining to groundwater have been enacted, none provide a complete or expedient solution to well-interference. Nebraska common law regarding groundwater modifies the so-called 'American rule,' and holds that a landowner may use the water beneath his land as long as the use is reasonable. But, in cases of water shortage, the water is apportioned equally. Since well-interference can occur as a result of reasonable uses, the problem is still unsettled. What is proposed instead is the adoption of a draft made by the authors of the Restatement of Torts. The proposed rule would not hold a beneficial user liable unless 'the withdrawal of water causes unreasonable harm through lowering the water table or reducing artesian pressure.' An important difference between the rules is that under the latter a reasonable use, even if causing harm to another's well, is permitted. The proposed rule provides a remedy to the harmed water user. The author concludes that the remedy would also be reasonable under the circumstances. (Malefatto-Florida)

W78-10858

#### COASTAL ZONE IMPACTS OF OFFSHORE OIL AND GAS DEVELOPMENT: AN ACCOMMODATION THROUGH THE CALIFORNIA COASTAL ACT OF 1976.

A. E. Yudes, Jr.

Pacific Law Journal, Vol. 8, No. 2, p. 783-809 (July, 1977).

Descriptors: \*California, \*Comprehensive planning, \*Coasts, \*Governmental interrelations, Pacific Coast region, Legislation, Oil industry, Exploitation, Leases, Continental shelf, Natural resources, Administrative agencies.

The federal Coastal Zone Management Act of 1972 (CZMA) is designed to encourage states to establish management plans for coastal areas. Yet the federally controlled program to lease outer continental shelf oil and gas tracts conflicts with the requirement that federal activities affecting coastal areas be consistent with state-developed plans. The conflict is evident in California which in 1976 passed its own Coastal Act requiring orderly coastal development. While California is responsible for coastal planning, under current leasing procedures it can only react to decisions made by federal agencies. It does not participate in the program until preparation of the environmental impact statement, after tracts are selected for leasing. California claims it must participate in the initial stages of the leasing program in order to develop effective coastal plans. Congress provided support for the California position in 1976 by amending the CZMA and specifically designating outer continental shelf leasing as an activity affecting the coastal zone. Federal agencies still maintain a narrow view of the CZMA, denying states participation in the leasing program. The author concludes that state participation should be allowed to ensure efficient and orderly development of offshore resources. (Malefatto-Florida)

W78-10859

#### THE UNITED STATES SUPREME COURT AND ARTICLE VII OF THE 1958 CONVENTION ON THE TERRITORIAL SEA AND CONTIGUOUS ZONE.

K. L. Walz.



### Group 6E—Water Law and Institutions

**Descriptors:** \*Boundary processes, \*Baseline studies, \*International waters, \*Bays, Jurisdiction, International commissions, Coasts, Legal aspects, International law, Judicial decisions.

W78-10860

Consolidated Edison Co. of New York, Inc., New York

W78-10861

## H. Hopson.

1977.

## Land deve

W78-1086

**Maine Law Review, Vol 29, No 1, p 47-72, 1977.**

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W78-1086

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W78-108

## V. SEELKE (CHANGE IN RIVER CHANNEL BY

Okl. App., 568 P.2d, p 650-654 (1977).

Riparian la

Florida)

## 31 Or. App.

Mineral i

W78-104

## TALIM

Water quality:

W78-10867

262 N.W.2d

reclamation

W78-1086

438 F. Supp. 1001

lants, W

**Descriptors:** \*Environmental effects, \*Environmental control, \*Channeling, \*Engineers' estimates, \*Cost-benefit analysis, Channels, Channel improvement, Environment, Water quality, Stream flow, Environmental engineering, Drainage engineering, Irrigation engineering, Floodways, Migration, Migratory birds, Water quality standards.

Plaintiff environmental groups sought a determination that a final revised environmental impact statement (EIS) filed by the Army Corps of Engineers in conjunction with the Cache River-Bayou DeVoe Channelization Project, did not comply with the National Environmental Policy Act (NEPA). The trial court had concluded that the EIS was adequate, and had vacated its previously issued injunction restraining project construction. Affirming the trial court decision, the Eighth Circuit Court of Appeals stated that: (1) discussion of remote and highly speculative environmental impacts is not required within an EIS, (2) discussion of project impacts on Arkansas was quality was not required because Arkansas law exempts channelized streams from state water quality standards, and (3) discussion of a leveed floodway with bypass alternative was not necessary since the EIS did discuss two similar alternatives. The court further found that the EIS adequately discussed the cumulative effects on migratory water fowl and plans to mitigate wildlife losses, and that the balance of cost-benefits formulated by the Corps of Engineers in the EIS was not arbitrary and capricious and gave sufficient weight to environmental factors. (Baumbach-Florida) W78-10867

**AMOCO OIL COMPANY V. STATE HIGHWAY DEPARTMENT (RIPARIAN OWNER'S LAND EXTENDS TO CENTER/THREAT OF NON-NAVIGABLE STREAM).**  
262 N.W.2d, 726 (1978).

**Descriptors:** \*North Dakota, \*Non-navigable waters, \*Riparian land, \*Eminent domain, \*Ownership of beds, Condemnation, State governments, Diversion, Properties, Property values, Water law, Streams, Compensation, Banks, Land reclamation, Legal aspects, Judicial decisions.

Plaintiff corporate property owner initially owned several lots adjacent to a non-navigable North Dakota river. The river was later diverted and its bed filled, making the plaintiff's land totally landlocked. The lots were subsequently condemned by the defendant State Highway Department, and the plaintiff contested the amount paid for the lots, claiming specifically that it should also be compensated for the newly created land lying between the original center/thread of the non-navigable river and its old bank. The court ruled that each riparian owner's land does extend to the center/thread of a non-navigable stream and ordered the defendant to pay the plaintiff and additional \$53,000 together with interest, costs, disbursements and attorney's fees for the land in question. In so ruling, the court rejected the defendant's claim that the use of the word 'bank' as a reference word in the legal description of the plaintiff's land, in lieu of the word 'river', manifested and evidenced a specific and clear intent to restrict the conveyance to the land not originally covered by water. (Easterbrook-Florida) W78-10868

**UNITED STATES V. VELSICOL CHEMICAL CORP. (POLLUTION OF NAVIGABLE RIVER RESULTING FROM DISCHARGE INTO CITY WASTE WATER COLLECTION SYSTEM).**  
438 F. Supp. 945-50 (W.D. Tenn. 1976).

**Descriptors:** \*Federal Water Pollution Control Act, \*Navigable rivers, \*Chemical wastes, \*Waste water (Pollution), Water pollution sources, Tennessee, Pollution abatement, Chemicals, Pollutants, Waste water disposal, Cities, Insecticides,

Chemical industry, Sewers, Permits, Water pollution, Navigable waters, Discharge (Water).

Defendant chemical corporation discharged pollutants into the Memphis, Tennessee, city waste water collection system, which discharged into the Mississippi River. The government brought suit against the corporation as an alleged discharger of pollutants into the Mississippi River. The defendant sought to have the suit dismissed, but the court denied the motion and granted summary judgment to the government. Noting that the defendant's discharge through conveyances owned by another party (the city system) did not remove the defendant's actions from the broad and remedial scope of the Federal Water Pollution Control Act, the court found that the defendant's discharge into the river through the city system satisfied the statutory requirements of discharging into water of the United States. In granting the plaintiff summary judgment, the court found: (1) the defendant to be a person within the meaning of the Act; (2) that the defendant did discharge a pollutant into navigable waters; (3) that the defendant's discharge was through a point source; and (4) that in so acting the defendant was in violation of its National Pollutant Discharge Elimination System permit. Consequently, the court ruled the defendant's actions were subject to civil penalties provided for by the Act. (Easterbrook-Florida) W78-10869

**MELVILLE V. SALT LAKE COUNTY (DEFINING PERCOLATING WATER FOR THE PURPOSE OF APPROPRIATION).**  
570 P.2d 687-89 (Utah 1977).

**Descriptors:** \*Utah, \*Domestic waters, \*Percolating water, \*Preferences (Water rights), Beneficial use, Building codes, Consumptive use, Judicial decisions, Legal aspects, Potable water, Prior appropriation, Reasonable use, Water allocation (Policy), Water distribution (Applied), Water law, Public health, Water utilization, Zoning.

Plaintiff landowners were denied building permits on the ground that they did not have an adequate supply of culinary water. The plaintiffs appealed, alleging that they had a generous supply of percolating water which they contended belonged to the owners of the land on which it was found. Although the spring, which was the source of the alleged percolating water, arose on property owned by one of the plaintiffs and could not be traced onto the land of others, the Utah Supreme Court held that the waters were not percolating because the waters did not beneficially affect the land. Accordingly, the waters were subject to appropriation under state law. The plaintiffs were required to prove some right to use it. Although the plaintiffs alleged that they possessed a contract which gave them the necessary right to use the water, the lower court found that the terms of the contract did not comply with the county's requirement that 400 gallons per unit per day to be available. The Utah Supreme Court affirmed this ruling. (Jordan-Florida) W78-10870

**WATER AND RELATED LAND RESOURCES PLANS.**  
Minn. Stat. sec 105.403 (1976).

**Descriptors:** \*Minnesota, \*Legislation, \*Water allocation (Policy), \*Stream improvement, Aquatic weeds, Drainage systems, Administrative agencies, Flood plains, Lakes, Land management, Local governments, Siltation, Soil erosion, Natural resources, Waste disposal, Water levels, Water supply development, Water treatment, Water utilization, Wetlands.

The commissioner of natural resources, in cooperation with other governmental agencies, shall prepare a statewide water and related land resources plan for presentation to the legislature

by November 15, 1975. This plan shall relate each of the programs of the department to the programs of the other agencies. The plan shall include, but not be limited to, provisions for the following: (1) regulation of land development and improvement by abutting owners of the beds, banks and shores of lakes, streams, watercourses, and marshes in order to preserve them for beneficial use; (2) regulation of improvements on and prevention of encroachments in the flood plains of the state; (3) reclamation of wet and overflowed lands; (4) repair and improvement of previously established public drainage systems; (5) preservation of wetlands; (6) management of game and fish resources; (7) alteration of stream channels for conveyance of surface waters, navigation, and any other public purpose; (8) regulation of the flow of streams and lake water levels; (9) maintenance of water supply; (10) sanitation, public health and regulation of waste disposal; (11) prevention of soil erosion; and (12) regulation of uses of water surfaces. (Jordan-Florida) W78-10871

**SEDIMENT CONTROL.**

Md. Code Ann. secs 8-1101, 8-1105.1 (1974), as amended (Supp. 1976).

**Descriptors:** \*Maryland, \*Coastal engineering, \*Legislation, \*Shore protection, \*Sediment control, Atlantic coastal plain, Beach erosion, Coastal structures, Coasts, Erosion, Erosion control, Land development, Natural resources, State governments, Water rights, Watersheds, Beaches, Watershed management.

Because the Maryland General Assembly has determined that the lands and waters comprising the watersheds of the State are great natural resources, criteria and procedures to implement soil and erosion control have been adopted by the Assembly. The Beach Erosion Control District has been created for the purpose of maintaining the Atlantic Coast beaches of the State. Any land clearing, construction activity, or the construction or placement of permanent structures within the District is prohibited. However, prohibition does not apply to any project approved by the District and the appropriate soil conservation district specifically for storm control, beach erosion and sediment control. If the building would constitute a taking of a property right under the Constitutions of the United States or Maryland, the property taken may be purchased. The District consists of that land bordered on the north by the Maryland-Delaware state line, on the east by the Atlantic Ocean, on the south by the Maryland-Virginia state line, and on the west by a line which coincides with the existing natural dune on Assateague Island and the Ocean City building limit line. (Jordan-Florida) W78-10872

**WATER COMMISSIONERS - DETERMINATION OF JOINT RIGHTS.**

Mont. Rev. Code sections 89-1001 thru 89-1024 (1947), as amended, (Supp. 1975).

**Descriptors:** \*Montana, \*Legislation, \*Prior appropriation, \*Water allocation (Policy), \*Water utilization, Adjudication procedure, Administration, Consumptive use, Irrigation water, Legal aspects, Legal review, Permits, Preferences (Water rights), Regulated flow, State governments, Water distribution (Applied), Water law, Water rights.

Whenever the rights of persons to use the waters of any stream, ditch, watercourse or other source of supply have been determined by a decree of a court of competent jurisdiction, the judge may, in his discretion, appoint a water commissioner. The water commissioner has the duty to admeasure and distribute the stored and supplemental waters to the users thereof as their interests may appear. The commissioner also has the authority to main-

### Group 6E—Water Law and Institutions

**ARROYO FLOOD CONTROL ACT (CREATION AND POWER OF FLOOD CONTROL AUTHORITY).**  
New Mexico Statutes Annotated sections 75-36-1 thru 22 (1968).

New Mexico has enacted the Arroyo Flood Control Act, thereby creating the Albuquerque Metropolitan Arroyo Flood Control Authority (AMAFA). The Act authorizes, empowers, and directs the AMAFA to acquire, equip, maintain, and operate a flood control system for the benefit of the authority and inhabitants of the affected region. The Act not only sets out the geographical boundaries of the AMAFA, but also establishes a board of directors with broad regulatory powers. The board is authorized to establish internal operating procedures and AMAFA bylaws as well as make and pass resolutions and orders on behalf of the AMAFA. In addition, the board exercises substantive powers necessary to the eventual creation of a flood control system. This includes the power to acquire, improve, equip, maintain and operate any project for the control of flood and storm waters located within the AMAFA. Projects which have their sources outside the AMAFA but flow into it also fall under the board's jurisdiction. Furthermore, the board is entitled to exercise the right of eminent domain, within or without the AMAFA. Broad contractual, taxing, and regulatory powers which enable the AMAFA to achieve its goals are also detailed. (Spector-Florida)

W7R-10874

Wyo. Sess. Laws, Chapter 203, section 41-29.1 (1973).

The holder of valid right to the direct use of the natural unstored flow of any surface stream of the state may store such flow, provided that no other Wyoming appropriator is injured by the storage. Prior to commencement of the storage, the holder of the right must submit a written request to the state engineer and obtain the approval of the state board of control. The state engineer is authorized to prescribe such regulations as are necessary to effectively administer the provision of this act. (Quarles-Florida)  
W78-10875

Wyo. Sess. Laws, Chapter 170, section 41-4.1  
(1973)

An owner of a water right must file a petition when he wishes to change a right to another use, or from the place of use under the existing right to a new place of use. The petition should give all pertinent facts regarding the present use and the proposed change, or, if a change of use is requested, all relevant information about the present place of use and the proposed place of use. A public hearing may be required by the board with the petitioner paying for and furnishing a transcript to the board. The change is to be granted, provided that the quantity of water transferred by the granting of the petition does not exceed the amount of water historically diverted under the existing use, nor exceed the historic rate of diversion under the existing use. In addition, the petition must not increase the historic amount of water consumptively used under the existing use, decrease the historic amount of return flow, or injure other existing lawful appropriations. The question of compensation, when at issue, shall be submitted to the proper district court for determination. (Quarles-Florida)

W78-10876

Wyo. Sess. Laws, Chapter 160, section 41-5 (1973).

Any appropriator owning a valid water right in the use of ground, surface, or reservoir water of the state may petition the state engineer to allow an exchange and the use of stored, direct flow, or groundwater from another source. The petition should be submitted in cases where the source of the appropriation is sometimes insufficient to fully satisfy such appropriation, or better conservation and utilization of the state's water may be accomplished, or the appropriator cannot economically convey appropriable water to its point of use. The state wishes to encourage exchanges, but an exchange order will not be issued if it would adversely affect other appropriators, or if in the opinion of the state engineer, the exchange would be too difficult to administer, or would be adverse to public interest. No exchange is allowed unless a sufficient amount of make-up water is introduced to replace the water withdrawn under the exchange. The state engineer may take consumptive use and transmission losses into consideration in determining the sufficiency of the make-up water. State water administration officials are to enforce the performance of each exchange.

(Quarles-Florida)  
W78-10877

379 A.2d, p 1251-1253 (New Hampshire, 1977).

level, Salt marshes, Beds, Plant groupings,  
Legislation, Legal aspects, Water law.

The State filed a petition seeking to compel the defendants to remove certain fill alleged to have been placed by them in violation of a state statute. The matter was referred to a Master who ruled in favor of the State. The section of the statute in question included two types of land; submerged land and land bordering tidal water subject to tidal action whose surface is below a certain elevation and upon which grow specified vegetation. The Master acted upon the basis that there were three types of land included in the statute. The supreme court found that the Master had misconstrued the statute. The court held that the land was not submerged or flowed by the mean high tide and, though the land bordered tidal water subject to tidal action and was at an elevation not exceeding three-and-one-half feet above the mean high tide, none of the vegetation specified by the statute was capable of growing there. Since the land did not fit all the requirements of the second type of land covered by the statute, the defendant's land was not subject to the regulation. (Beamer-Florida) W78-10878

**Descriptors:** \*New York, \*Riparian rights, \*Docks, \*Bulkhead line, \*Easements, Legal aspects, Water rights, Water law, Coastal structures, Piers, Reasonable use, Land tenure, Boats, Boating.

In a consolidation action to enjoin the appellant-respondents from interfering with the mooring of boats, the supreme court of New York entered a judgement fixing the rights of the parties. Both parties cross-appealed from the judgement. The appellate court held that the record established that the use of the south and north side of the dock was an existing one at the time of the severance of ownership and was necessary for the reasonable use of the upland property conveyed to the respondent-appellants. The court found that they had an implied easement to moor their boats on such tides. Nevertheless, as held by the trial court, due consideration of appellant-respondents' riparian rights requires that respondent-appellants should not use the first twenty feet thereof, as measured from the bulkhead. The relief afforded by the trial court of an easement to respondent-appellants to enter upon appellant-respondents' land for repair of the dock was found to be both unnecessary and unwarranted. (Beamer-Florida) W/78-10879

435 F. Supp., p 664-681 (D. Alaska, 1977).

**Descriptors:** \*Alaska, \*Easements, \*Land use, \*Waterways, Shores recreation, Rivers, Public lands, Treaties, Public access, Transportation, Utilities, Docks, Indian reservations, Navigable waters, Mineral industry, Pipelines, Legislation, Environment, Federal-state water rights conflicts, Administrative decisions.

In consolidated cases, plaintiffs sought to challenge action by defendant Secretary of the Interior who reserved easements upon lands patented under the Alaska Native Claims Settlement Act. Defendant issued several orders, one of which authorized a reservation to the United States of a continuous shoreline easement along the coastline of Alaska. He also ordered the State Director, Bureau of Land Management, to reserve public easements to the United States in all conveyances



under the Act for transportation of energy fuel and natural resources. The specific location of these easements were to be determined at an indefinite future date. Plaintiffs contended that the Secretary exceeded his authority. The United States District Court, Alaska, held that: (1) the Secretary was not bound to choose from easements recommended by the land use planning commission; (2) the Secretary is bound in his choices by specific criteria in the Act; (3) reservation of a continuous shoreline easement without showing of necessity was void; (4) riverbank easements which reserved far more than necessary for mere access to public lands were not valid; and (5) easements for transportation of natural resources must be specifically located. (Quarles-Florida)

W78-10880

**SIERRA CLUB V. CAVANAUGH**  
(REQUIREMENT OF ENVIRONMENTAL IMPACT STATEMENTS FOR CONSTRUCTION OF RURAL WATER SYSTEMS).

447 F. Supp. 427-433 (S.D.S.D., 1978).

Descriptors: \*South Dakota, \*Rural areas, \*Environmental effects, \*Water supply, Construction, Legal aspects, Administrative agencies, Administrative decisions, Agriculture, Water quality, Judicial decisions, Water shortage.

Plaintiff, a non-profit California corporation, brought an action pursuant to the National Environmental Policy Act seeking to enjoin further construction of and hook-up to two rural water systems until an environmental impact statement was prepared on each project. The facts surrounding the two systems were sufficiently distinct to merit separate consideration by the court. Both defendant water systems are funded by the Farmers Home Administration (FHA) and are intended to serve rural residents and bulk users which consist of municipalities. Plaintiff contended the systems would create widespread environmental consequences such as water shortages, urban sprawl, and reduced water quality. One defendant contended the suit was improper because the plaintiff's members waited too long to initiate it. The District Court accepted the defendants' contention after finding an inexcusable delay by the plaintiff in asserting the claim which resulted in undue prejudice to the defendant. As for the other water system, the court concluded that the environmental impacts of the construction would not significantly affect the quality of the human environment. Therefore it was reasonable for the FHA to determine that an environmental impact statement was not required. (Quarles-Florida)

W78-10881

**REVIEW OF PROJECTS AFFECTING SOLE SOURCE AQUIFERS.**

Title 40, Code of Federal Regulations, Part 149, Sections 149.1-149.11 (July 1, 1977).

Descriptors: \*Public health, \*Texas, \*Underground storage, \*Water pollution sources, Administrative agencies, Aquifer management, Aquifer systems, Groundwater recharge, Project planning, Water supply, Projects, Regulations.

The Regional Administrator of the Environmental Protection Agency may review any project which he considers may potentially lead to contamination of the Edwards Underground Reservoir, near San Antonio, Texas, through its recharge zone so as to create a significant hazard to public health. In determining whether to review the project, the Administrator shall consider whether the project is: (1) located within the recharge area, or (2) of a nature that could cause contamination. The Administrator shall give notice to the originating federal agency in writing, and to the public, of any decision to review a project. Where there is significant public interest, the Administrator may hold a public hearing with respect to the project to be reviewed. As soon as possible after public com-

ment and the submission of information from the originating federal agency, the Administrator shall review the project. After publication of a decision that a proposed project may contaminate the reservoir through its recharge zone thus creating a significant hazard to public health, no commitment for federal financial assistance may be entered into for such a project. (Jordan-Florida)

W78-10882

**TWIN LAKES RESERVOIR, ETC. V. CITY OF ASPEN**  
(PRIOR APPROPRIATORS CHANGE OF NATURE OF USE OF WATER RIGHTS).

568 P. 2d 45-50 (Colo. 1977).

Descriptors: \*Water rights, \*Colorado, \*Prior appropriation, \*Use rates, Appropriation, Priorities, Judicial decisions, Water allocation(Policy), Water utilization, Competing uses, Water distribution(Applied), Reservoir operation.

The company-appellee had filed an application for change of nature of use of water rights from direct flow and storage for irrigation purposes to direct flow and storage for irrigation, domestic, commercial, industrial, municipal, and all beneficial purposes. Six municipalities, which sought to use water derived from company systems in their municipal systems, owned 65% of the company. The water court initially permitted the use change with stipulations. The decision was appealed by city and county commissioners, and water and sanitation district officials. Affirming the water court's decree, the appellate court held that: (1) appellants and others holding junior priorities would not be injured because more water from the company's 'Independence Pass Transmountain Diversion System' (IPTDS), would be lost to Colorado without the change in use; (2) municipalities using IPTDS water would be subject to the same limitations on use as the company; and (3) evidence sufficiently supported the conclusion of the water court that volumetric limitations operating annually and on a ten year average constituted a reduction from the contemplated draft of the original appropriation and therefore the change in use was not improper. (Baumbach-Florida)

W78-10883

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD V. SUPERIOR COURT OF KERN COUNTY**  
(AN EXCEPTION TO EXHAUSTION OF ADMINISTRATIVE REMEDIES DOCTRINE).

142 Cal. Rptr. 821-825 (Ct. App. 1977).

Descriptors: \*California, \*Administrative decisions, \*Drainage programs, \*Judicial decisions, Administrative agencies, Decision making, Legal aspects, Regulations, Drainage systems, Permits, Environmental effects, Legal review.

In the trial court, a county was seeking an injunction based on the appellant Regional Water Quality Control (Board's alleged failure to observe the California Environmental quality) Act (CEQA) in prescribing waste discharge requirements for a water drainage project. The appellant filed this action seeking to restrain the appellee trial court from proceeding with the county's injunction action. At issue was whether the trial court had jurisdiction to hear the case since it was alleged that the county had not exhausted all its administrative remedies. The appellate court held that the trial court had jurisdiction. Firstly, judicial review of an administrative action is not barred when sought by one who is not a party to that administrative action. Here the county was not a party to the administrative action, but had sought an injunction against it in the public interest as provided by the CEQA. Secondly, the exhaustion of administrative remedies will also be excused when the aggrieved party can state assuredly what the agency decision will be. Here an appeal to the state board from the waste discharge requirements of appellant board would have been futile. (Baumbach-Florida)

W78-10884

**NATURAL RESOURCES DEFENSE COUNCIL, INCORPORATED V. COSTLE**  
(WATER QUALITY CONTROL REQUIRED BY FEDERAL WATER POLLUTION CONTROL ACT).

564 F. 2d 573-583 (D.C.Cir. 1977).

Descriptors: \*Federal Water Pollution Control Act, \*Regulation, \*Waste treatment, \*Water pollution control, Administrative agencies, Agriculture, Channels, Cities, Federal government, Inland waterways, Law enforcement, Legislation, Planning, Silviculture, Pollution abatement, Water law, Water pollution, Water pollution sources, Water quality, Water quality control.

The National Resources Defense Council brought an action in district court seeking (1) a declaratory judgement constraining Section 208 of the Federal Water Pollution Control Act (FWPCA), and (2) an order directing the Environmental Protection Agency (EPA) to promulgate regulations consistent with the plaintiff's interpretation of the FWPCA. The lower court held for plaintiff and the EPA appealed. Section 208 directs the EPA to publish guidelines for the identification of those areas having substantial water control problems. However, the EPA contended that Section 208 did not require the same level of planning in every area of the state. If the EPA's original interpretation of the statute was correct, 95% of the country's area would not be subject to Section 208 planning because the area had not been designated as having water quality control problems. The appellate court affirmed the lower court's decision finding that Section 208 sets up a comprehensive scheme for the elimination of water pollution in all areas of a state, both urban-industrial and agricultural areas. The court felt that it is unreasonable to believe Congress intended to exempt from this scheme 95% of the state's areas. (Jordan-Florida)

W78-10885

**COUNTY OF SUFFOLK V. SECRETARY OF THE INTERIOR**  
(ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT).

562 F. 2d 1368-1391 (2d Cir. 1977).

Descriptors: \*Exploration, \*Leases, \*Environmental effects, \*Environmental control, Water resources development, Projects, Industrial production, Offshore platforms, Land management, Governmental interrelations, Cost-benefit analysis, Energy, Pipelines, Inter-agency cooperation, Oil industry, Natural gas, Oil, Exploitation, Economics of scale.

Plaintiffs, concerned towns, counties and the Natural Resources Defense Council, brought suit to challenge an environmental impact statement (EIS) prepared by defendant Secretary of the Interior. The EIS related to a proposal to accelerate leasing of the federally owned Outer Continental Shelf to private industry for energy exploration and development. The lower court ruled that the EIS was inadequate, and voided leases made by the Secretary and intervenor defendants appealed. In reversing and vacating the injunction, the appellate court held that the EIS was not inadequate under the National Environmental Policies Act (NEPA). The court stated that the multi-stage project is environmentally divisible, and that some phases of the project could not feasibly be covered within this early stage EIS. Therefore, failure to thoroughly assess the environmental consequences of the later stage of transporting the energy did not render this EIS fatally defective. Rather, the NEPA sufficiency requirements for an EIS are met if the EIS: (1) has set forth responsible opposing scientific views, (2) has factually-based conclusions, (3) was compiled in objective good faith, and (4) would permit a decisionmaker to fully consider and balance ascertainable environmental factors. (Baumbach-Florida)

W78-10886

## Field 6—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

**CHUDZINSKI V. CITY OF SYLVANIA (LIABILITY FOR DAMAGE CAUSED BY INCREASE AND ACCELERATION OF SURFACE WATER FLOW).**  
372 N.E. 2d 611-616 (Ohio Ct. App. 1976).

**Descriptors:** \*Ohio, \*Flood damage, \*Surface drainage, \*Reasonable use, Damages, Outlets, Outlet works, Pipes, Surface waters, Overflow, Cities, Flow rates, Legal aspects, Judicial decisions, Ditches, Water law.

Plaintiff landowners brought an action for damages against defendants, municipality and private corporation, for loss of property due to flooding caused by their action. Defendant/corporation constructed a shipping center and was required by the defendant/municipality to increase the size of the inlet to a watercourse which traversed plaintiff's property. The result was an increase and acceleration in the flow of surface water into the watercourse. This caused periodic flooding of plaintiff's land which rendered a portion of it useless. Citing U.S. Supreme Court decisions, defendant/municipality argued that the capacity-of-the-stream rule should be applied. This rule allows increase and acceleration of watercourse flow to the extent of bank capacity. Noting the confusion surrounding the capacity rule, the appellate court held that the reasonable use rule should be adopted. Under the reasonable use rule, the possession of land only incurs liability when his interference with the flow of surface water is unreasonable. The court reversed judgment for the defendants, requiring that a test of reasonableness be applied to their actions. (Malmad-Florida)  
W78-10887

**NAVIGABLE WATERS (DREDGE AND FILL DISCHARGE REGULATIONS).**  
Title 40, Code of Federal Regulations, Part 230, Sections 230.1-230.8 (July 1, 1978).

**Descriptors:** \*Permits, \*Dredging, \*Environmental effects, \*Federal Water Pollution Control Act, Water quality, Water utilization, Environmental control, Administrative agencies, Aquatic environment, Navigable waters, Wetlands, Regulation.

The Environmental Protection Agency (EPA) herein sets forth guidelines for the issuance of permits for the discharge of dredged or fill material at specific disposal sites, pursuant to the Federal Water Pollution Control Act of 1972. Where application of the guidelines precludes the discharge of dredged or fill material, an evaluation is made of the economic impact on navigation and anchorage which will occur by failing to use the proposed disposal site. Prohibited are discharge of dredged or fill material at disposal sites which would have an unacceptable adverse effect on municipal water supplies, shellfish beds, fisheries, wildlife, or recreational areas. These EPA regulations describe the physical ecological effects and the chemical-biological interactive effects that may result from the discharge of dredged or fill material. The effects of discharges on aquatic organisms and human uses of navigable waters range from mild disruption to irreversible change at the disposal site. Technical approaches to evaluate such effects are presented. The guidelines for selection of disposal sites are applicable to all activities involving the discharge of dredged or fill material into the navigable waters of the United States. (Curtis-Florida)  
W78-10888

#### OIL POLLUTION PREVENTION.

Title 40, Code of Federal Regulations, Part 112, Sections 112.1-112.7 and appendix (July 1, 1977).

**Descriptors:** \*Oil pollution, \*Oil spills, \*Water pollution control, \*Federal Water Pollution Control Act, Planning, Water law, Regulation, Ad-

ministrative agencies, Water pollution effects, Water pollution treatment, Navigable waters, Facilities.

The Environmental Protection Agency has established procedures, methods and regulations to prevent the discharge of oil from non-transportation related onshore and offshore facilities into the navigable waters of the United States and adjoining shoreline, pursuant to the Federal Water Pollution Control Act of 1972. These regulations apply to operators and owners of facilities engaged in drilling, producing, storing, refining, processing, transferring, distributing, or consuming oil and oil products, which due to their locations, could reasonably be expected to discharge oil in harmful quantities. Exempted are onshore and offshore facilities which, due to their location, could not reasonably be expected to discharge harmful quantities of oil into the navigable waters of the United States. The regulations also provide for the preparation and implementation of spill prevention control and countermeasure (SPCC) plans. SPCC plans complement existing laws and procedures pertaining to safety standards, fire prevention, and pollution prevention rules intended to minimize the potential for oil discharges. Civil penalties are established to deter violations of these oil pollution prevention regulations. Owners and operators would be subject to fines for each day a violation continued. (Curtis-Florida)  
W78-10889

#### WATER QUALITY STANDARDS.

Title 40, Code of Federal Regulations, Part 120, Sections 120.1-120.115 (July 1, 1977).

**Descriptors:** \*Federal Water Pollution Control Act, \*Water quality standards, \*Salinity, \*Colorado River Basin, Administrative agencies, State governments, Legislation, Water quality control, Environmental control, Water pollution, Standards, Regulation.

These Environmental Protection Agency (EPA) herein sets forth guidelines for the issuance of permits for the discharge of dredged or fill material at specific disposal sites, pursuant to the Federal Water Pollution Control Act of 1972. Where application of the guidelines precludes the discharge of dredged or fill material, an evaluation is made of the economic impact on navigation and anchorage which will occur by failing to use the proposed disposal site. Prohibited are discharges of dredged or fill material at disposal sites which would have an unacceptable adverse effect on municipal water supplies, shellfish beds, fisheries, wildlife, or recreational areas. These EPA regulations describe the physical ecological effects and the chemical-biological interactive effects that may result from the discharge of dredged or fill material. The effects of discharges on aquatic organisms and human uses of navigable waters range from mild disruption to irreversible change at the disposal site. Technical approaches are applicable to all activities involving the discharge of dredged or fill material into the navigable waters of the United States. (Curtis-Florida)  
W78-10890

#### STATE PROGRAM ELEMENTS NECESSARY FOR PARTICIPATION IN THE NATIONAL POLLUTION DISCHARGE ELIMINATION SYSTEM.

Title 40, Code of Federal Regulations, Part 124, Sections 124.1-124.94 and appendix (July 1, 1977).

**Descriptors:** \*Water quality standards, \*Water pollution control, \*Federal Water Pollution Control Act, \*Permits, Regulation, Governmental interrelations, Administrative agencies, Pollution abatement, Discharge(Water), Effluents, Monitoring, Planning.

Herein are guidelines specifying procedural and other elements required in a state or interstate pro-

gram for issuance of National Pollutant Discharge Elimination System (NPDES) permits. After a submitted state or interstate program, which conforms to the guidelines and section 402 of the Federal Water Pollution Control Act, has been approved by the Environmental Protection Agency (EPA), then EPA will suspend its issuance of NPDES permits. Requirements for contents of state statutes which must prohibit all discharges of pollutants without an NPDES permit, form of state statutory authority, and definitions are provided. Permissible exclusions for identified dischargers and state procedures for NPDES filing requirements are outlined. Guidance is also provided concerning: state receipt and use of federal data; date transmission to EPA; identity of signatories of NPDES forms; notice and public participation; formulation of tentative determinations and draft NPDES permits; fact sheets; hearings; prohibited discharges; application of effluent standards and limitations; water quality standards; duration and reissuance of permits; monitoring and reporting; enforcement; disposal of pollutants into wells; concentrated animal feeding operations; separate storm sewers; agricultural and silvicultural activities; resources planning requirements; NPDES forms; and other requirements. (Huffman-Florida)  
W78-10891

#### BRADFORD V. SIMPSON (LIABILITY IMPOSED FOR EROSION DAMAGE AND CONTROL RESULTING FROM ILLEGAL DAM CONSTRUCTION).

573 P. 2d 149-152 (Idaho, 1978).

**Descriptors:** \*Flood damage, \*Bank erosion, \*Riprap, \*Idaho, \*Dams, Erosion control, Soil erosion, Legal aspects, Judicial decisions, Legal review, Negligence, Water law, Rivers, Property values, Dam construction, Erosion, Bank protection, Channels.

In a previous action, the Idaho Supreme Court found that the defendant was liable for flood damage to the plaintiff's property, and remanded the case to the district court for further proceedings on the issue of damage. On rehearing, the district court concluded that as a result of defendant's damming the branch of a river fronting on plaintiff's property, the property suffered considerable erosion damage; was still subject to erosion; could never be restored to its previous condition; that riprapping to prevent continued erosion would cost more than \$20,000; and that the value of the property has decreased by almost \$25,000. The district court found that the defendant was 90% negligent, and awarded plaintiff 90% of the riprapping cost, plus punitive damages. In this appeal, defendant claimed that the riprapping had already been provided for in a separate action in which the court ordered the state to do the necessary erosion control work at defendant's expense. However, the Idaho Supreme Court found that the area covered by the previous order did not include plaintiff's land and affirmed the district court's decision. (Stump-Florida)  
W78-10892

#### MORSE V. DIVISION OF STATE LANDS (PERMITS FOR LANDFILL PROJECTS MAY BE GRANTED ONLY AFTER A CONSIDERATION OF THE PUBLIC INTEREST AND A SHOWING THAT LAND WILL BE USED FOR WATER-RELATED ACTIVITY).

572 P. 2d 1075-1078 (Or. Ct. App. 1977).

**Descriptors:** \*Oregon, \*Landfill, \*Permits, \*Planning, \*Water resources, Recreation, Public rights, Administrative agencies, Navigation, Navigable waters, Legal aspects, Estuaries, Fishing, Conservation, State governments, Legislation.

The city of North Bend, Oregon, applied to defendant Division of State Lands for a permit to fill 32

acres of the at the North proved the p adversely affect the action. A proved the order granting public has been of waterway tion uses, an that interest. filling water public inter promulgated these is that be used for noted that way would not have been W78-10893

**ENVIRONN FORATED DISTRICT FORCE U WASTE W WATER FR REAU).**  
572 P. 2d 11

**Descriptors:** Law, \*Wat intrusion, V tribution(A) porting, Riv

Plaintiffs, dividuals, v fendant utili tion challen trict and the which provi water from demands. R future cust utility were diminish recreation, wild river San Francisco violation and the trial of California controlled failed to a because the court also sought relief board precluded against the Florida) W78-10894

**STATE EX TRIC CO POWER PROSCRIBED THROUGH CIENT WA 559 S.W. (Rehearing)**

**Descriptor:** \*Pollution Regulation Fishkill, Discharge

Plaintiff st ant privat mitting th downstrea

acres of the Coos Bay estuary to extend a runway at the North Bend Airport. The defendant approved the permit, and plaintiffs, as persons adversely affected by the proposed filling, contested the action. After a hearing, the defendant reappraised the permit, and plaintiffs sought judicial review. The Oregon Court of Appeals reversed the order granting the permit after noticing that the public has a paramount interest in the maintenance of waterways for navigation, fishing and recreation uses, and that the state has a duty to protect that interest. The defendant may issue permits for filling waters, as long as it first considers the public interest. In addition, the Division itself has promulgated several rules to follow, and one of these is that the land created by fill projects must be used for water-related activities. The court noted that all parties agreed that the airport runway would not be used for a water-related activity. The court thus concluded that the permit should not have been issued. (Stump-Florida) W78-10893

**ENVIRONMENTAL DEFENSE FUND, INCORPORATED V. EAST BAY MUNICIPAL UTILITY DISTRICT (UNSUCCESSFUL ACTION TO FORCE UTILITY DISTRICT TO RECLAIM WASTE WATER, RATHER THAN PURCHASE WATER FROM FEDERAL RECLAMATION BUREAU).**  
572 P.2d 1128-1142 (Cal., 1977).

Descriptors: \*California, \*Federal Reclamation Law, \*Water supply, \*Water reuse, Saline water intrusion, Water demand, Water rates, Water distribution (Applied), Water requirements, Water importing, Rivers, Public utilities.

Plaintiffs, three corporations and three individuals, were residents of an area served by defendant utility district. Plaintiffs brought an action challenging a contract between the utility district and the United States Bureau of Reclamation which provided for the utility district to purchase water from the Bureau in expectation of increasing demands. Plaintiffs alleged that this would cause future customers to pay a higher price than if the utility were to reclaim waste water; that it would diminish flows on the American River, injuring recreation, increasing salination, and accelerating wild river destruction; and that it would pollute San Francisco Bay. Plaintiffs claimed these actions violated sections of the California Constitution and the California Water Code. In affirming the trial court's dismissal of the action, the California Supreme Court decided that federal law controlled the proceeding, and that appellants failed to state an appropriate cause of action because they based their claims on state law. The court also ruled that plaintiffs should first have sought relief from the regional water quality control board, and having failed to do so, were precluded from maintaining a cause of action against the municipal utility district. (Stump-Florida) W78-10894

**STATE EX REL ASHCROFT V. UNION ELECTRIC COMPANY (NORMAL ACTIVITIES OF POWER GENERATING PLANT NOT PROSCRIBED BY STATE STATUTES EVEN THOUGH THEY RESULT IN OXYGEN DEFICIENT WATER DISCHARGE).**  
559 S.W.2d 216-224 (Mo. Ct. App. 1977) (Rehearing denied December 5, 1977).

Descriptors: \*Missouri, \*Dissolved oxygen, \*Pollution abatement, \*Utilities, Water pollution, Regulation, Dams, Hydroelectric plants, Rivers, Fishkill, Water quality standards, Discharge (Water).

Plaintiff state of Missouri sought to enjoin defendant private electric company from causing or permitting the dissolved oxygen level in waters downstream from the company's power plant

from falling below the statutory standard of five milligrams per liter. Plaintiff also sought damages of \$10,000 per day until the standard was met, and to recover damages for fish killed. The Kansas City District Court of Appeals ruled that the plaintiff failed to allege facts sufficient to constitute a valid cause of action, or to entitle the state to relief. The court analyzed the appropriate sections of the Missouri Water Quality Standards and of the Missouri Clean Water Law, noting that many of the terms used in the laws were capable of varying interpretations. The court stated that its ultimate goal was to discover and implement the legislative intent in the laws. Attempting to do so, the court concluded that the activities of the electric company in the usual course of its business did not rise to the level of conduct proscribed by the Clean Water Law. (Stump-Florida) W78-10895

**GENERAL REFRACTORIES COMPANY V. ROGERS (MUD AND SEDIMENT DEPOSITS RESULTING FROM OPERATION OF NEARBY MINING OPERATION).**  
239 S.E. 2d 795-801 (Ga. 1977).

Descriptors: \*Mining, \*Land reclamation, \*Georgia, \*Water control, Overburden, Surface waters, Judicial decisions, Diversion, Floods, Sedimentation, Sediment, Mud, Reclamation, Rainfall, Vegetation, Sediment distribution, Dam.

Plaintiff landowner sued defendant mining company, claiming damages to his property. He alleged that defendant's mining operations increased the flow of surface water onto his land, causing large quantities of mud and dirt to be deposited on his property. He, therefore, sought to enjoin these operations. Claiming that defendant's actions were wilful and reckless, plaintiff also demanded both general and punitive damages. The court held in favor of the plaintiff on the issue of damages and also awarded him attorney's fees. The permanent injunction was granted. Defendant appealed, claiming that the plaintiff was not entitled to punitive damages because there was no proof of wilful misconduct or that lack of care that would raise the presumption of a conscious indifference to consequences. The appellate court reversed the award of punitive damages and attorney's fees, finding that no such evidence existed. Instead, the court found that the defendant had acted in compliance with the Surface Mining Act. The permanent injunction, however, was affirmed and remained in force. (Spiegel-Florida) W78-10896

**TEXAS COUNTY IRRIGATION AND WATER RESOURCES ASSOCIATION, INCORPORATED V. CITIES SERVICE OIL COMPANY (USE OF FRESH GROUNDWATER IN SECONDARY OIL RECOVERY).**  
Okla., 570 P.2d 49-51 (Okla. 1977).

Descriptors: \*Oklahoma, \*Secondary recovery (Oil), \*Groundwater resources, \*Permits, Oil industry, Flooding, Groundwater movement, Management, Irrigation water, Water permits, Regulation, Flood irrigation.

Appellants, a private corporation, joined by the Oklahoma Water Resources Board (Board), appealed the District Court reversal of the Board's decision to grant the corporation a permit to use fresh ground water in a water flood system for secondary oil recovery. Appellee, county irrigation association, protested the approval of the permit on the ground that the statutory definition in the Oklahoma Ground Water Law denotes such use of fresh water as 'waste'. Based on that definition, the irrigation association claimed, and the District Court agreed, that the permit should not have been granted. However, in its reversal of the District Court, the Oklahoma Supreme Court stated that absent express legislation so stating, it would be difficult to decide that the use of fresh

ground water for secondary oil recovery is waste per se. The Court interpreted the history of the ground water law as reflecting a legislative intent not to arbitrarily classify all uses of fresh ground water in secondary oil recovery as 'waste'. The Court qualified its holding, saying that such would not necessarily be true under all circumstances. (Stump-Florida) W78-10897

**UNITED STATES V. CITY OF PAWHUSKA, OKLAHOMA (MINERAL RIGHTS UNDER MUNICIPAL RESERVOIRS).**  
566 F.2d 1132-35 (10th Cir. 1977).

Descriptors: \*Oklahoma, \*Indian reservations, \*Land tenure, \*Reservoirs, \*Trespass, Acreage, Damages, Federal reservations, Judicial decisions, Land use, Legal aspects, Mineralogy, Public lands, Reservoir sites, United States, Value, Water law, Oil.

As trustee for an Indian tribe, the United States brought suit against a city, alleging a continuous trespass and seeking monetary damages for the tribes loss of access to certain tribal mineral rights underlying a reservoir maintained by the city. The trial court awarded the United States damages of \$50.00 an acre and held that 858.64 acres had been affected by the reservoir. The trial court also vested the defendant city with complete title to the land under the reservoir. The United States appealed the portion of the order that gave the tribe's mineral interest to the city. The City appealed the monetary award, contending that the reservoir affected only 290.93 acres. The Tenth Circuit of Appeals held that damages could be claimed by the United States for only 290.93 acres because the United States had agreed to this in a stipulation. The appellate court also held that the trial court could not award complete title to the land beneath the reservoir to the city because the issue of quieting title was not before the court. (Jordan-Florida) W78-10898

**NATIONAL INDEPENDENT MEAT PACKERS ASSOCIATION V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (EFFLUENT REGULATIONS FOR MEAT PROCESSORS).**  
566 F.2d 41-44 (8th Cir. 1977) Rehearing and Rehearing En Banc Denied January 3, 1978.

Descriptors: \*Administrative agencies, \*Industrial wastes, \*Waste water treatment, Water quality control, Abatement, Chemical wastes, Industries, Industrial plants, Judicial decisions, Law enforcement, Legal aspects, Waste treatment, Water pollution, Water pollution control, Water treatment.

An organization representing a number of relatively large slaughterhouses and meat processors throughout the nation and some of its individual members petitioned for review of effluent discharge regulations promulgated by the Environmental Protection Agency (EPA). The petitioners advanced a number of challenges to the limitation based on alleged inadequacies and inaccuracies in the technical data upon which the EPA grounded its determination. The regulations established limitations on (1) biochemical oxygen demand, (2) total suspended solids, and (3) ammonia. The EPA contended that since the seventh circuit had decided those same issues in another case and still retained jurisdiction, the eighth circuit should defer its judgment. The Eighth Circuit Court of Appeals held for the EPA, stating that uniform regulation of water pollution on a nationwide basis was a major purpose of the Federal Water Pollution Control Act. Since essentially all of the technical contentions raised by the petitioners were also presented to the seventh circuit, the court found that the interest in avoiding inter-circuit conflicts was especially strong. Otherwise potentially conflicting decisions would present different interpretations of federal law intended to be uniformly applied on a nationwide scale. W78-10899



## Field 6—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

**FORD MOTOR COMPANY V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (ADMINISTRATIVE GUIDELINES NECESSARY TO DENYING PERMITS).**  
567 F.2d 661-77 (6th Cir. 1977).

**Descriptors:** \*Permits, \*Adjudication procedures, \*Flow augmentation, \*Waste dilution, \*Water quality standards, Administrative agencies, Cooling water, Effluents, Federal Water Pollution Control Act, Great Lakes, Industries, Industrial wastes, Industrial water, Heavy metals, Metals, Navigation, Regulation, Water pollution, Water pollution control, Water pollution effects.

An appeal was taken by plaintiff automobile manufacturers from an action of the Environmental Protection Agency (EPA). The EPA vetoed modifications of the manufacturer's existing National Pollutant Discharge Elimination System (NPDES) permit. These modifications were proposed by the Michigan Water Resource Commission pursuant to the Federal Water Pollution Control Act (FWPCA). The plaintiff proposed to mix treated effluents from its metal stamping plant with other water from Lake Erie in order to reduce the concentration of pollutants and to assure compliance with water quality standards. The plaintiff contended that the EPA had exceeded its veto authority because there were no published regulations, guidelines or statutory requirements under the FWPCA which prohibited the use of low-flow augmentation to meet water quality standards. The Sixth Circuit Court of Appeals held that the FWPCA allows the EPA to object only to the issuance of NPDES permits which are 'outside the guidelines and requirements' of the FWPCA, objections can not be based upon the EPA's private policy determinations. Since it was clear to the court that the EPA had no prior well-established policy which prohibited low-flow augmentation, the court set aside the EPA veto. (Jordan-Florida) W78-10900

**BURGESS V. M/V TAMANO (OIL SPILL ACCIDENT CAUSED BY MISPLACED BUOY).**  
564 F.2d 964-983 (1st Cir. 1977).

**Descriptors:** \*Accidents, \*Naval architecture, \*Negligence, \*Oil pollution, Atlantic Ocean, Damages, Hazards, Legal aspects, Maine, Navigation, Oil, Oily water, Risks, Safety, Ships, Water law, Water pollution, Water pollution sources.

A Norwegian supertanker, her owners and the pilots who were piloting the ship when it struck a submerged ledge and spilled oil brought an action against the United States. The plaintiff alleged that the United States caused the accident by mislocating a buoy. The U.S. counterclaimed for certain cleanup costs. The trial court decided in favor of plaintiff ship and the U.S. appealed. Evidence revealed that a Coast Guard buoy tender had examined the channel two days before the accident and had mistakenly repositioned two buoys but did not reposition the buoy in question. In addition, there was evidence that the collision itself had moved the buoy in question so that an independent surveyor found all three buoys off position after the accident. The appellate court vacated the trial court's decision and held that: (1) the trial court's finding that the buoy was misplaced was clearly erroneous, (2) evidence that the pilot steamed to within a few feet of a buoy known to be almost on top of an invisible ledge established negligence, (3) the owners were liable to the government for cleanup costs, and (4) liability of the ship did not release the pilot from the consequences of his negligence. (Jordan-Florida) W78-10901

**LAFLEUR V. TOPP (FLOODING CAUSED BY NEIGHBOR'S LEVEE).**  
352 So.2d 426-28 (La. Ct. App. 1977).

**Descriptors:** \*Louisiana, \*Boundary disputes, \*Drainage area, \*Floods, \*Levees, Backwater, Boundaries(Property), Dam construction, Dams, Dikes, Drainage, Easements, Flood damage, Land tenure, Legal aspects, Overflow, Spillways, Water law, Water levels.

Plaintiff landowner brought an action against the adjoining landowner seeking an injunction to prohibit the latter from maintaining a dam on his property. The dam allegedly flooded the plaintiff's property by interfering with a natural drain. The plaintiff also sought an order to force the defendant to lower the dam to the level which existed before the defendant raised it in 1974. The dam existed on defendant's property for many years before 1974. In 1974, dirt work was done on the levee. The plaintiff contended that this raised the level of the dam two or three feet and caused water to stand on plaintiff's property. The court held that defendant had a right to maintain the levee only in a way which would not result in water being impounded on plaintiff's property any more than it did before the 1974 work was done. The court further found that the plaintiff had a right to the unimpeded natural servitude of drainage of water from his land through defendant's property. The court directed that a spillway low enough to drain any water impounded on plaintiff's property be built at the defendant's expense. (Jordan-Florida) W78-10902

**VILLANI V. BERLE (ACTION BY NEW YORK COMMISSIONER OF ENVIRONMENTAL CONSERVATION TO CLOSE SHELLFISH LANDS IN NEW YORK BAYS UPHELD).**  
398 N.Y.S.2d 796-805 (1977).

**Descriptors:** \*New York, \*Testing procedures, \*Shellfish farming, \*Coliform, Analytical techniques, Methodology, Shellfish, Pollutant identification, Public health, Harbors, Bays, Fishing.

Plaintiffs, private individuals and municipalities, sought to enjoin defendant New York Commissioner of Environmental Conservation from closing to harvesting certain shellfish areas in the Long Island area on public health grounds. The Commissioner acted after 1975 and 1976 findings by the Regional Office to the Commissioner of Environmental Control of a higher than normal amount of pollutants in the subject waters. This was determined by the coliform standard of testing and use of MPN (most probable number) methodology. Plaintiffs attacked the implementation of these tests as unscientific and claimed that the subsequent closing of the shellfishing areas was illegal and arbitrary. The Suffolk County, New York, court admitted that the testing standards have been criticized over a period of time, but denied the injunction, stating that no other tests have the credentials of valid criteria, standardized methodology, and economy. The court also ruled that, because the Commissioner's action in directing the closing of the shellfish lands involved an administrative determination, it was not necessary to hold a public hearing as required by the State Administrative Procedure Act. (Stump-Florida) W78-10903

**RESERVE MINING COMPANY V. HERBST (DESIGNATION OF ALTERNATE WASTE DISPOSAL SITE AS 'FEASIBLE AND PRUDENT').**  
256 N.W.2d 808-852 (Minn., 1977).

**Descriptors:** \*Waste disposal, \*Damsites, \*Minnesota, \*Permits, \*Mine wastes, Forests, Disposal, Air pollution, Air pollution effects, Water pollution, Administrative decisions, Public health, Administrative agencies, Pollutants, State governments, Industrial wastes, Wastes, Pollution abatement, Sites, Dam construction, Economic impact, Feasibility.

The state appealed from a court order directing state pollution control agencies to grant a permit to respondent mining company for the construction of an on-land disposal site needed for the disposal of materials that could cause air and water pollution. The state would require disposal at a more remote, forest site, a 'feasible and prudent' alternative posing less hazard to public health. The Montana supreme court held that disposal at either site involved a significant hazard to public health and that the state's choice additionally violated the principle of consolidated land use by intruding into a natural resources recreational oriented area. The court held that the state site was not a 'feasible and prudent' alternative and that the proper course was to require the company to mitigate pollution at its chosen site. Where the evidence showed the undisputed safety of the company proposed waste disposal structures, the statute allowing alternatives where impairment of natural resources is likely has no application. The court will not assume that the company will disregard its responsibility to construct a proper structure. Faced with such evidence, state agencies must consider the economic impact in rendering environmental decisions. (Smith-Florida) W78-10904

**STATE V. HOFFMAN (STATE'S RIGHT TO SUE UNDER FEDERAL STATUTES).**  
425 F. Supp. 71-80 (S.D.111., 1977).

**Descriptors:** \*Channeling, \*Environmental effects, \*Navigable rivers, \*Natural flow, Channel improvement, Dredging, Federal Water Pollution Control Act, Environment, Fishing, Fish reproduction, Flood control, Aquatic life, Illinois, Environmental control, River beds, Navigable waters, Legal aspects, Dam construction, Water law, Landfills, Levees, Dams, Rivers and Harbor Act.

The state of Illinois brought an action against the Army Corps of Engineers, the Administrator of the Environmental Protection Agency and others for injunctive and other relief to compel the restoration of the Machinau River, a navigable river of the United States, to its natural course. The controversy arose after the defendants rechanneled the course of the river destroying substantial areas of fishing habitat and extensive feeding and spawning areas for aquatic life as well as increasing flood hazards for landowners upstream and downstream from the affected area. The state alleged that the defendants violated several federal statutes including the Rivers and Harbors Act, the Federal Water Pollution Control Act, and the National Environmental Policy Act. The defendants filed motions for summary judgment and dismissal. The District Court held that the defendant's motion for summary judgment was inappropriate because substantial fact issues existed, including the question of navigability of the river and the participation of federal officials in the rechanneling project. The court overruled all of the defendant's motions for dismissal holding that the petition was sufficient to allege a cause of action. (Beamer-Florida) W78-10905

**MOBIL OIL CORPORATION V. KELLEY (STATE JURISDICTION OVER WATER POLLUTION).**  
426 F. Supp. 230-236 (S.D. Ala., 1976).

**Descriptors:** \*Federal Water Pollution Control Act, \*Water pollution, \*Oil, \*Leases, Legislation, Water Quality Act, Oil fields, Oil industry, Exploration, Natural gas, Drilling, Oil pollution, Water pollution sources, Oil wells, Rent, Alabama, Contracts, Beds, Beds under water, Administrative agencies.

Plaintiff oil company brought an action in federal district court for declaratory and injunctive relief against the state of Alabama concerning leases

held by the wells. The state leases to the state polluting plaintiff's cation coverage was not permit to drill plaintiff sought grant certificate District Court civil review of Water Pollution state court. pollution knowledge of in reaching adequate state intervention necessary for (Beamer-Florida) W78-10906

**MAKRANSKI EASEMENT**  
398 N.Y.S.2d

**Descriptors:** \*York, \*Bull, Reasonable plied benefit Boats, Repertories.

The plaintiff defendants from Both parties rights of the waterway. The trial court modified, at that the plaintiff and north side easement re severance of to be necessary plaintiff's upland held that the dock m only, pursuant owners of was to be n Florida) W78-10907

**STATE EX REGULAT**  
570 P.2d 11

**Descriptors:** \*Mining, \*Mining, \*Trenches, tion, Claims(Cor agencies, A

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held by the plaintiff for drilling of offshore oil wells. The state had granted the plaintiff several leases to submerged land in Mobile Bay, but, later, the state pollution control agency refused to certify plaintiff's application for a permit to drill at a location covered by one of the leases. State certification was necessary in order to obtain a federal permit to drill. Basing jurisdiction on diversity, the plaintiff sought to enjoin the state from refusing to grant certification in the federal district court. The District Court held that the proper forum for judicial review of state certification under the Federal Water Pollution Control Act Amendments was in state court. The court found that the state water pollution control agency had the required knowledge of local factors that should be weighed in reaching a final determination. Since there was adequate state court review available, federal intervention on a state certification question was not necessary for the protection of federal rights. (Beamer-Florida) W78-10906

**MAKRANSKY V. MILLER (USE OF IMPLIED EASEMENTS FOR NAVIGATION).**  
398 N.Y.S. 2d 575-576 (N.Y. App. Ct. 1977).

Descriptors: \*Navigable water, \*Docks, \*New York, \*Bulkheads, Navigation, Riparian rights, Reasonable use, Legal aspects, Easements, Implied benefits, Water law, Claims(Contracts), Boats, Repairing, Adjudication procedure, Properties.

The plaintiff brought an action to enjoin the defendants from interfering with the mooring of boats. Both parties appealed a decision which fixed the rights of the parties to use a dock on a navigable waterway. The appellate court's decision modified the trial court's opinion slightly and as so modified, affirmed the judgement. The court held that the plaintiff is entitled to use of both the south and north sides of the dock pursuant to an implied easement resulting from existing use at the time of severance of ownership. This easement was found to be necessary for the reasonable use of the plaintiff's upland property. However, the court further held that the first twenty feet on the south side of the dock must be reserved to the defendant's use only, pursuant to the defendant's riparian rights as owners of the adjacent bulkhead. This distance was to be measured from the bulkhead. (Spector-Florida) W78-10907

**STATE EX REL. COX V. HIBBARD (STATE REGULATION OF MINING).**  
570 P. 2d 1190-1195 (Or. App. 1977).

Descriptors: \*Oregon, \*Regulation, \*Permit, \*Mining, \*Constitutional law, State jurisdiction, Mining engineering, Diversion structures, Trenches, Contracts, Bank stability, Bank erosion, Streambeds, Placer mining, Claims(Contracts), Legal aspects, Administrative agencies, Administrative decisions.

The defendants appealed a decision enjoining them from removing in excess of 50 cubic yards of material in any year from a creek without first obtaining a permit from the Director of Oregon Division of State Lands. The defendants claimed the regulation acted to unconstitutionally deprive them of enjoyment of their property, constituted a taking without compensation, and violated their freedom to contract as secured by the United States Constitution. They also claimed that federal mining laws, the Admissions Act, and the United States Constitution preempted the state's authority to require permits prior to digging water diversion trenches in and near creeks. In this decision, the appellate court upholds the state's claim of authority to require such permits, declares such a system to be compatible with federal constitutional and statutory law, deems there to be no unconstitutional impairment of the right to contract

in this case, and states that the Director's actions did not amount to an unconstitutional taking of the defendant's property. (Spector-Florida) W78-10908

**PENDERGRAST V. AIKEN (LIABILITY OF DOWNSTREAM PROPERTY OWNERS FOR FLOOD DAMAGE RESULTING FROM INTERFERENCE WITH STREAM FLOW).**  
236 S.E. 2d 787-801 (N.C. 1977).

Descriptors: \*Surface drainage, \*Flood damage, \*Surface waters, \*Drainage water, \*North Carolina, Flood protection, Floodproofing, Rain-fall, Rain water, Culverts, Watercourses(Legal aspects), Pipes, Landfills, Streams, Watersheds(Basins), Drainage effects, Drainage practices, Drainage systems, Properties, Drainage.

Plaintiffs, upstream property owners, sought to recover for flood damage allegedly caused by a nuisance on defendant's adjoining downstream property. Defendant, downstream property owners, paid the co-defendant construction company to fill in much of their property with dirt. In order to allow the continued drainage of the surrounding area, defendants placed a pipe in the creek flowing through the property and then filled the creek and property. During subsequent normal rainstorms, the creek backed up. This backup resulted in flooding of the plaintiff's property. Plaintiff contended that the pipe was too small to allow normal drainage. Upon plaintiff's appeal to the Supreme Court of North Carolina, the court held that with respect to surface water drainage, each possessor may make reasonable use of his land even though harm is caused to others, but liability is incurred when flow interference is unreasonable and causes substantial damage. The court called for a new trial due to the lower court's error in instructing the jury on nuisance, damage, and supplemental drainage. (Quarles-Florida) W78-10909

**ESTABLISHMENT OF LAKE IMPROVEMENT DISTRICTS.**

Minn. Stat. secs 378.41 through 378.56 (1976).

Descriptors: \*Minnesota, \*Legislation, \*Water resources development, \*Lakes, \*Comprehensive planning, Administration, State governments, Local governments, Water law, Planning, Regulation, Governmental interrelations, Project planning, Recreation, Conservation, Multiple-purpose projects, Natural resources, Non-structural alternatives, Project purposes, Regional development.

A local-state program for the establishment of lake improvement districts is to be instituted and supervised by the commissioner of natural resources. A county board may designate areas as lake improvement districts in order to finance the development and implementation of programs for water and related land resources management. Designation of districts shall be established by a resolution specifying territorial boundaries, the types of water resource management programs to be established, financing arrangements, and the individual responsible for supervision. Citizens may request creation of lake improvement districts by submitting a petition signed by five percent of the voters in the proposed district to the county board. After holding public hearings, the board shall act on the request. In the event of disapproval, the petition may be presented to the commissioner of natural resources, who may approve it. A petition may also be submitted to the county board requesting a referendum of voters in the proposed district. If the voters approve the creation of a lake improvement district, it is deemed created. The county board may impose service charges on those using lake improvement districts, or levy taxes on property in the district. (Malefatto-Florida) W78-10910

**FEDERAL RECLAMATION AND WATER RIGHTS IN NEVADA,**  
California State Univ., San Diego. Dept. of History.  
D. J. Pisani.  
Agricultural History, Vol. 51, No. 3, July, 1977. p 540-558.

Descriptors: \*Federal-State water rights conflicts, \*Federal reclamation law, \*Reclamation states, Competing uses, Indian reservations, Southwest US, \*Nevada, \*Lake Tahoe, \*Paiute Indians, Pyramid Lake, Truckee River, \*Newlands Reclamation Act.

Since their initiation in 1905, Federal reclamation projects in Nevada have exacerbated water rights controversies between California and Nevada, as well as between these states and the Federal Government. The dispute over the Federal Government's claim to Lake Tahoe's surplus water, the conflict between the Reclamation Bureau and established agricultural interests in Nevada, and the controversy over the use of Pyramid Lake water exemplify the complications introduced by Federal reclamation projects. Much confusion could have been avoided by postponing these projects until already existing water rights controversies had been settled. However, the Federal Government is not entirely to blame, as the limited water supply could not satisfy all competing users and the legal system could not adjust quickly enough to the increased importance of water for industrial and recreational use, as opposed to agricultural needs. (Russell-Arizona) W78-10974

**PRODUCTS LIABILITY: LET THE SELLER BEWARE.**

M. R. Richard.

Water Well Journal, Vol 32, No 7, p 59-62, July, 1978.

Descriptors: \*Insurance, \*Legislation, \*Product liability suits, Judicial decisions, Water equipment products, Pumps.

New warranty and product safety laws enable consumers who suffer personal or property damage in connection with the use of a product to more easily sue manufacturers. A 1976 estimate shows 1.5 million product liability suits annually. This compels manufacturers to raise their prices. Vulnerable areas in water equipment product design and manufacture are outlined and several lines of action are presented for manufacturers to reduce their chances of being involved in a product liability suit, and to prepare a defense if sued. There is a need for reliable statistics on the specific causes of product liability suits, trends in premium rates, and their influence on prices on consumer goods. Fourteen states now have product liability reform legislation and reforms are expected in all states by 1980. Over 30 product liability bills are pending in both houses of Congress and a House Subcommittee on Miscellaneous Revenue Measures began hearings in June. A case history of a product liability suit involving a defective water well pump is presented. (Purdin-NWWA) W78-11069

**WATER SUPPLY AND CONTROL DEVELOPMENTS SUMMARIZED: ARIZONA.**

For primary bibliographic entry see Field 3D.  
W78-11076

**LE DROIT QUEBECOIS DE L'EAU (THE RIGHT OF THE PEOPLE OF QUEBEC REGARDING WATER),**  
Quebec, Ministère des Richesses Naturelles.  
G. Lord.

Available from Centre de Recherche en Droit Public, Université de Montréal, Québec, Canada, 2 Vols., (March, 1977). 1049 p.

## Field 6—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

**Descriptors:** \*Canada, \*Internal water, \*Water law, \*Water policy, Subsurface waters, Spring waters, Riparian waters, Running waters, Planning, Environmental control, Water quality standards, Water pollution treatment.

In 1975 a comprehensive study was begun of the status of the laws on the interior waters of Quebec. A 1977 report of the principal results of the study covered such topics as: the constitutional setting; the criteria for navigability and buoyancy; individual laws; the laws of state ownership; administrative powers; law regarding water quality; and public laws. In order to analyze the water laws, it was necessary to consider the unique political ambience of Quebec and its effect on any future laws. It was concluded that Quebec has the requisite legislative power to establish a modern water code comparable to those already enacted by a number of other countries. The first volume includes a thorough discussion of the laws on subterranean waters, spring waters, running waters, and riparian waters, comparing the laws of 1888, 1899, 1919 and 1969, and proposing solutions to the current problems. The second volume discusses municipal waters, irrigation and drainage, flooding, pollution, water quality control, natural resources, environmental quality and conservation. (Beamer-Florida)

W78-11151

**REASONABLE-BENEFICIAL USE: NEW STATUTORY STANDARD FOR WATER RESOURCES ALLOCATION-INTERPRETATION AND RECOMMENDATIONS,** Florida Univ., Gainesville. School of Law. S. Fleming.

Available from Eastern Water Law Center, University of Florida, Holland Law Center, Gainesville, Florida 32611, for \$1.75. (Spring, 1978). 29 p., 1 append.

**Descriptors:** \*Legislation, \*Florida, \*Water resources, Permits, Competing uses, Domestic water, Consumptive use, Usufructuary right, Riparian rights, Water allocation(Policy), Water utilization, Regulation.

The Florida Water Resources Act (Act) requires that a consumptive use permit be issued by a local water management district to any prospective consumptive user of water. The Act mandates issuance of the permit upon proof of a 'reasonable-beneficial' use of the water. However, there are no guidelines to determine what is a 'reasonable-beneficial' use of water. This note attempts to avoid the possibility of successful constitutional attack on the Act by identifying factors which should be used as determinative criteria. Through an analysis of the legislative history of the Act and an examination of judicial construction of the term 'reasonable-beneficial' use by other state court systems, the author determines that other than for domestic use—which has been held a reasonable-beneficial use per se—local districts should balance several factors, including: economic efficiency; waste; social value; harm to existing users; and the purpose of the use. Although these factors have been identified, the author concludes that a statutory preference system will afford the best implementation of the Act. A model system is appended. (Stump-Florida)

W78-11152

**THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS AND MINING OPERATIONS: AN OIL AND GAS LAWYER'S VIEW,** Hanna and Morton, Los Angeles, CA.

For primary bibliographic entry see Field 5G. W78-11153

**THE EFFECTS OF THE FEDERAL SAFE DRINKING WATER ACT ON OIL, GAS, AND**

**MINING OPERATIONS: BITTERSWEET OR UNPALATABLE,** Saunders, Snodgers, Ross and Dickerson, Denver, CO.

For primary bibliographic entry see Field 5G. W78-11154

**THE PUBLIC INTEREST IN WATER RIGHTS ADMINISTRATION,** California State Dept. of Water Resources, Sacramento.

R. B. Robie. Rocky Mountain Minera Law Institute, Vol. 23, p 917-940 (1977).

**Descriptors:** \*Water rights, \*Competing uses, \*Water allocation(Policy), \*Preferences(Water rights), California, Riparian rights, Natural flow doctrine, Reasonable use, Prior appropriation, Public benefits, Beneficial use, Water law.

After reviewing the traditional bases of water rights administration (riparian rights doctrine or natural flow theory, the doctrine of prior appropriation and the California correlative rights system) the author of this article to manage water as a public resource because of the changing public needs. Because public interest in water use has increased considerably in recent years, there is a definite need to update these traditional allocation systems. The major portion of this article examines the bases for recognizing the public interest and the assertion and application of that interest. Because many users have an existing property right in their use of water, the power of the state to place additional conditions and restraints upon those existing water rights takes on great significance. The article concludes with a statement that water rights are in a state of evolution, and that new administrative procedures must be developed to fairly protect the growing public interest. (Stump-Florida)

W78-11155

**WATER QUALITY MANAGEMENT PLANS AND THEIR IMPACT ON MINING OPERATIONS,** Burlington, White, Burke and Ipsen, Denver, CO.

For primary bibliographic entry see Field 5G. W78-11156

**THE TWO-TIERED MARKET IN WESTERN WATER,** New Mexico Univ., Albuquerque. School of Law. W. H. Ellis, and C. T. Du Mars. Nebraska Law Review, Vol. 57, No. 2, p 333-367 (1978).

**Descriptors:** \*Water allocation(Policy), \*Irrigation water, \*Water management(Applied), \*Water risks, Water distribution(Applied), Water consumption, Water law, Water control, Water costs, Legal aspects, Water rights, Reclamation.

Water controlled by Bureau of Reclamation projects and state conservancy districts is insulated from market pressure by federal and state constraints on transferability. The result is an artificially low price level for farming interests able to purchase in the 'project market', an artificially high price level for industry and municipal interests that must purchase water in the 'native market'. Without congressional action, project water will remain insulated from the native market because farming interests have considerable legal authority for maintaining project water for irrigation purposes only. If the two markets are merged, farming may become unfeasible in some areas due to a possible large increase in the cost of irrigation water rights. Some of the disparity may be reduced by eliminating confusion surrounding the transfer of native water rights, a model for which is provided in this article. The changes needed to reduce transaction costs in the native water market, and thus reduce the discrepancy, would include im-

proving the market allocation of native water, solving quantification problems, reducing the cost of necessary quantification, and avoiding return flow problems. (Rule-Florida)

W78-11157

**INDIAN WATER RIGHTS: A STATE PERSPECTIVE AFTER AKIN,** Wyoming Attorney General's Office, Cheyenne. J. D. Palma, II.

Nebraska Law Review, Vol. 57, No. 2, p 295-318 (1978).

**Descriptors:** \*Prior appropriation, \*Reservation doctrine, \*Federal-state water rights conflicts, \*Indian reservations, Legal aspects, Water rights, Jurisdiction, Judicial decisions, Relative rights, Competing uses, Water supply, Water utilization.

Western United States water rights are determined according to the appropriation doctrine as applied by each state within its borders. Appropriators' rights are currently uncertain, however, where the rights involve waters reserved in part by the federal government for the use of Indian reservations. Where the claims of prior appropriators and Indians conflict, the Indians' reserved right will prevail if their claim is consistent with the original purpose of the reservation. It is not clear how much water could reasonably be required to sustain most reserved right purposes. The extent to which changes in the use or place of use of Indian water rights can be made is also not clear. The resolution of these and other uncertainties over the scope of Indian water rights is complicated by the fact that the reservation doctrine has been judicially created and defined. Issues are adjudicated in a piecemeal fashion and appropriators' water rights remain uncertain. From the states' standpoint there is an imperative need to inventory Indian water requirements and to adjudicate and quantify Indian rights within the state court systems. State jurisdiction would best integrate state water law with the federal claims. (Baumbach-Florida)

W78-11158

**ALLOCATION OF RIGHTS TO WATER: PREFERENCES, PRIORITIES AND THE ROLE OF THE MARKET,** Florida State Univ., Tallahassee. School of Law.

J. C. Oeltjin, and L. K. Fischer. Nebraska Law Review, Vol. 57, No. 2, p 245-282 (1978).

**Descriptors:** \*Water rights, \*Water allocation(Policy), \*Water policy, \*Preferences(Water rights), Water law, Prior appropriation, Beneficial use, Priorities, Legal aspects, Water management(Applied), Water utilization.

Allowing market forces to play an expanded role in the allocation of water rights would encourage efficiency in water use. Governmental action would still be necessary to apportion water rights between the public and private sectors, and to administer the public rights. Riparian rights, water preferences, and the doctrine of prior appropriation are systems in use in various parts of the country, modified in some areas by appropriation permit systems, constitutional, legislative, judicial or administrative preference schemes. No existing preference scheme reflects economic reality. Instead, all represent values which are not likely to continue to represent the most beneficial use of water resources under changing conditions. In some jurisdictions water rights cannot be voluntarily transferred even when neither third parties nor the public interest would be harmed by the transfer. An alternative model of water allocation should reflect market forces, thus providing a realistic market value and an incentive for efficient water use. Most of the current restrictions on water rights impede the movement of rights toward their highest and best uses. Legal restrictions would not be needed if the current uses

reflected the (Rule-Florida) W78-11159

**ENVIRONMENTAL DEVELOPMENT** Texas Tech. F. F. Skiller. Baylor Law (Fall, 1977)

**Descriptors:** Act, \*Com quality control, E sources, E development

**Present** presents se new energy development mean the environment ministrative amined in the produc energy. V production within the tion Contr also discuss research and establ federal awr pol FWPCA concernin created at review of mental Pr in interpret liability fo the FWP amined in (Rule-Fl W78-1116

**GEOTHERMAL IN TEXAS** D. A. Ho. Baylor L (Fall, 197

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reflected the highest possible economic purposes.  
(Rule-Florida)  
W78-11159

**ENVIRONMENTAL LAW ISSUES IN THE DEVELOPMENT OF ENERGY RESOURCES,**  
Texas Tech Univ., Lubbock. School of Law.  
F. F. Skillern.  
Baylor Law Review, Vol. 29, No. 4, p 739-820  
(Fall, 1977).

Descriptors: \*Federal Water Pollution Control Act, \*Comprehensive planning, \*Energy, \*Water quality control, Water pollution, Environmental control, Environmental effects, Water pollution sources, Environment, Ecology, Water resources development.

President Carter's National Energy Plan (Plan) presents serious challenges for the development of new energy alternatives. There is concern that development of different energy resources will mean the sacrifice of environmental quality. The environmental issues raised, and the judicial, administrative, and legislative responses are examined in this article, with particular emphasis on the production of oil, gas, coal, lignite, and nuclear energy. Water quality problems arising from production and use of various energy sources are within the scope of the 1972 Federal Water Pollution Control Act Amendments (FWPCA) and are also discussed. Plan objectives include encouraging research and development of new technology and establishing a cooperative effort between federal and state governments to abate or reduce water pollution. A major problem area under the FWPCA was the judicial review of regulations concerning effluent limitations standards. This created another issue dealing with jurisdiction for review of standards set by the federal Environmental Protection Agency. Other problems arose in interpreting the provisions for enforcement of liability for oil discharges and spills imposed under the FWPCA. Cases under the FWPCA are examined in conjunction with the problem areas.  
(Rule-Florida)  
W78-11160

**GEOHERMAL RESOURCE DEVELOPMENT IN TEXAS,**  
D. A. Howard.  
Baylor Law Review, Vol. 29, No. 4, p 993-1012,  
(Fall, 1977).

Descriptors: \*Geothermal studies, \*Thermal water, \*Proprietary power, \*Texas, Water resources development, Water temperature, Energy, Judicial decisions, Regulation, Thermal properties, Steam.

Geothermal energy—the use of steam or water found under intense heat and pressure within the earth—is brought to the surface to generate electricity through steam turbines or is utilized as natural heat. Geothermal energy does not readily fit any current definition of ownership. The 1975 Texas Geothermal Resources Act is similar to the 1970 Federal Steam Act in its resource definition, but the Texas Act has two sections potentially involving the question of ownership. First, the policy statement apparently suggests that the characterization of ownership which encourages the most rapid development of the resource is the most desirable, subject to the protection of relative rights and the environment. Second, the Texas Railroad Commission is given primary enforcement responsibility over the exploration, development, and production of geothermal energy on public and private lands. Arguably, the legislative intent was that geothermal energy should be part of the mineral estate. Courts and legislatures have apparently assumed that private ownership of geothermal resources will be recognized, so the issue of surface or mineral characterization would appear to depend primarily on the definitional approach adopted by the court. (Rule-Florida)

W78-11161

**THE DEEPWATER PORT ACT OF 1974: THE DEFINITION OF ADJACENT COASTAL STATES,**  
S. C. Barkley.  
Baylor Law Review, Vol. 29, No. 4, p 1051-1063  
(Fall, 1977).

Descriptors: \*Oil industry, \*Environmental effects, \*Ships, \*Deep water, Bodies of water, Legislation, Coasts, Decision-making, Water pollution sources, Regulation, Oceans, Transportation.

The 1974 Deepwater Port Act was passed in response to the need for deeper port facilities for transshipping imported oil from very large crude carriers to smaller tankers for final delivery to United States ports. The Act provides for licensing and regulation of artificial port facilities constructed in international waters off the U.S. coast. Oil would be pumped to the coastline from port facilities through an underwater pipeline. In recognition of the danger of environmental damage to nearby states from oil spills, any state which has been declared an adjacent coastal state would have absolute veto power over the construction and licensing of a deepwater port which posed an environmental threat. Unless the number of states designated as adjacent coastal states for any deepwater port construction license application is limited, most projects run a serious risk of veto. The Secretary of Transportation has interpreted the Act to limit the states that might be designated as adjacent coastal states, relying primarily on environmental impact statements prepared by the U.S. Coast Guard for his designations rather than on the recommendations of the Administrator of the National Oceanographic and Atmospheric Administration. (Rule-Florida)  
W78-11162

**UNITED NATIONS WATER CONFERENCE: AGREEMENT ON GOALS AND ACTION PLAN,**  
M. Falkenmark.  
Ambio, Vol. 6, No. 4, p 222-227 (July-August, 1977).

Descriptors: \*United Nations, \*Comprehensive planning, \*Water resources development, \*Water management (Applied), International commissions, Optimum development plans, Feasibility, Economics, Financing, Irrigation engineering, Agriculture, Water supply, Water conservation.

At the Mar Del Plata Conference attention was directed toward efficient and cooperative use of the earth's fixed stock of water. Major goals included: (1) safe water for every individual by 1990; and (2) a worldwide program for the intensification and improvement of water development in agricultural production. The conference delineated needs and strategies for increased planning and management, training and research, and international cooperation. Resolutions and Action Plans were established. The Action Plans urged individual countries to establish priorities and timetables for the achievement of objectives. Regional and international coordination of research and training programs was urged. It was recommended that mobilization of local sources of finance be encouraged, but that increased loans and grants from foreign sources should also be sought by developing countries. It was further recommended that, within two years of the conference, phased programs of financial requirements should be available for preservation to appropriate governmental bodies. Also proposed was the coordination of international support programs for the mobilization, planning, coordination and monitoring of international financial aid and technical assistance in the field of water development. (Baumbach-Florida)  
W78-11163

**INTERIM ASSESSMENT OF WASHINGTON STATE SHORELINES MANAGEMENT,**  
Washington Univ., Seattle. Dept. of Geography.  
M. McCrea, and J. H. Feldmann.  
Coastal Zone Management Journal, Vol. 3, No. 2,  
p 119-146 (1977).

Descriptors: \*Comprehensive planning, \*Shore protection, \*Management, \*Washington, Coastal structures, Legislation, Land management, Regulation, Project post-evaluation, Coastal engineering, Coasts, Permits.

Washington State's Shoreline Management Act (SMA) has been a pioneer effort in comprehensive land and water management. This article examines the first three years (1971-1974) of the program. Focusing on the permit system as mandated by the SMA, the paper covers three main topics: (1) a general description of how shoreline permits are issued and appealed; (2) an examination of problems encountered in translating legislative policy into administrative action; and (3) an initial assessment of the effect of the SMA on the allocation of coastal resources. An additional analysis is made of shoreline development exempt from SMA permit requirements. The article concludes that the permit process has successfully minimized the environmental damage of developments through modifying, instead of prohibiting development proposals. Such modifications include restricting bulkhead and landfill activities, imposing site planning and landscaping conditions, and scaling down and settling back shoreline structures from the water. However, omitting certain developments from permit requirements has somewhat undermined the intent of the Act; for example, exempt single family residences composed more than one-half of all onshore development in the area examined. (Baumbach-Florida)  
W78-11164

**LOS ANGELES V. SAN FERNANDO: GROUND WATER MANAGEMENT IN THE GRAND TRADITION,**  
Southern California Metropolitan Water District of Los Angeles.  
V. E. Gleason.  
Hastings Constitutional Law Quarterly, Vol. 4,  
No. 4, p 703-714 (Fall, 1977).

Descriptors: \*California, \*Water management (Applied), \*Prescriptive rights, \*Water rights, Judicial decisions, Groundwater reservoirs, Municipal water, Water allocation (Policy), Competing uses, Water storage, Water supply development, Water utilization.

The San Fernando decision represents a major judicial contribution to California groundwater law. The application of the mutual prescription doctrine was limited by: (1) strict requirements for establishing notice of adversity; and (2) confirmation that California law bars prescription of water rights dedicated to public uses. On the issue of groundwater storage rights the court established: (1) the right to store water in natural underground basins as long as the storage does not unreasonably impair native groundwater rights; (2) the right to protect stored water from expropriation by others; and (3) the right to recapture stored water. Further, the court reasserted as a matter of constitutionally mandated public interest, that all water rights must be subject to reasonable conditions and priorities in their use, and that legal solutions to water rights problems must minimize waste and maximize beneficial use. According to this article, the San Fernando opinion has already become a working guide in several areas of water resource management. The article gives a brief review of each of the rulings in the case. (Baumbach-Florida)  
W78-11165

**MAINTENANCE OF MINIMUM INSTREAM FLOWS IN SOUTH DAKOTA,**  
T. L. McBride.

## Field 6—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

South Dakota Law Review, Vol. 23, No. 1, p 181-192 (1978).

Descriptors: \*South Dakota, \*Water control, \*Water conservation, \*Public rights, Appropriation, Reservation doctrine, Water utilization, Water permits, Recreation, Fish management, Pollution abatement.

In this comment the author explores the potential for applying existing South Dakota law to protect the state's instream flows. Two basic mechanisms are suggested: (1) appropriation by the state of a quantity of water that is to remain in the water-course; and (2) reservation of a minimum amount of water necessary to preserve the public interest. In order the appropriation method to be effective, the state must limit the application of or redefine several appropriation doctrine concepts as they would be applied to the state. The author then discusses existing South Dakota law with regard to the beneficial use, man-made diversion requirement, and priority date concepts imbedded in the appropriation doctrine. Similarly, if the reservation mechanism is to be an effective means of protecting instream flows, the author feels that the 'public interest' must be interpreted broadly to include protection of fish, wildlife, and recreation. Whichever mechanism South Dakota chooses, the author concludes that a legislative mandate is needed to expedite the identification of the state's streams and quantities to be protected. (Anderson-Florida)

W78-11166

**THE IMPACT OF DEFINING 'BENEFICIAL USE' UPON NEBRASKA WATER APPROPRIATION LAW,**  
T. E. Icenogle.  
Nebraska Law Review, Vol. 57, No. 1, p 199-208 (1978).

Descriptors: \*Nebraska, \*Legislation, \*Beneficial use, \*Appropriation, Streamflow, Diversion, Natural recharge, Consumptive use, Preferences (Water rights), Water distribution (Applied), Legal aspects, Water rights.

Nebraska Legislative Bill 149, which would define the types of beneficial uses for which stream water may be appropriated, is currently pending before the state legislature. This article examines the wording of that bill, points out certain shortcomings and suggests improvements to it. Although not defining 'beneficial use', the Nebraska constitution and statutes implicitly recognize four beneficial uses of water: domestic, agricultural, manufacturing, and power generation. The proposed statute would add to those recognized uses the following uses: 'recreation, fish and wildlife, ground water recharge and storage, waste assimilation, navigation, and any other purpose having public value.' Since the bill does not establish any priorities among the categories of uses, the author fears that the statute will result in merely a vague standard permitting wide agency discretion in granting appropriation permits. Additionally, the author feels the bill should explicitly provide that the securing of minimum stream flow and the instream appropriation for recreational, wildlife, and navigational uses are 'beneficial uses' within the scope of the statute. (Anderson-Florida)

W78-11167

**GROUNDWATER MANAGEMENT IN NEBRASKA WITHOUT A LEGISLATIVE SOLUTION: IS THERE AN ALTERNATIVE,**  
M. Klein.  
Nebraska Law Review, Vol. 57, No. 1, p 78-90, (1978).

Descriptors: \*Nebraska, \*Water management (Applied), \*Groundwater resources, \*Legislation, Analysis, Surface-groundwater relationships, Water resources development, Subsur-

face waters, Legal aspects, Groundwater, Water conservation.

This analysis of the 1975 Nebraska Ground Water Management Act (Act) reveals several deficiencies in the Act. First, groundwater problem areas are not automatically within the scope of the Act, but must first be designated as a 'control area' by the Director of Water Resources after such designation has been actively sought by persons within the proposed control area. The author reasons that actual problems may go unrecognized or ignored by local citizens and argue that a governmental agency should be given authority to instigate the designation procedure. Secondly, the Act fails to address such important issues as whether private property rights in groundwater are immediately cut off by the Act, whether any priority system exists within the scheme of groundwater control, and whether the Act extinguishes the existing judicial doctrine banning interbasin transfers. In addition, the author notes that the Act lacks a definition of beneficial use and assigns no value to environmental, recreational, or aesthetic considerations in the preference scheme. The author concludes by analyzing the judicial means of resolving the issues raised by the inadequacies of the Act. (Anderson-Florida)

W78-11168

**STATE JURISDICTION TO ADJUDICATE INDIAN RESERVED WATER RIGHTS,**  
J. Taylor, and D. Birdbear.  
Natural Resources Journal, Vol. 18, No. 1, p 221-235 (January, 1978).

Descriptors: \*Federal-state water rights conflicts, \*Reservation doctrine, \*Indian reservations, \*Prior appropriation, Political aspects, Federal jurisdiction, State jurisdiction, Judicial decisions, Water policy, Competing uses, Water users, Water utilization.

Debate continues over the impact of recent court decisions on whether state or federal courts have the power to adjudicate federally reserved Indian water rights. States seek jurisdiction in hopes of quantifying the amount of water entailed and thus clarifying the rights of appropriators who use partially reserved waters. However, it is feared by some that state courts, some of which are subject to the biases of the electorate, will not adequately protect Indian water rights and the federal trust responsibilities to Indians. A key United States Supreme Court decision recently provided that state and federal courts have concurrent jurisdiction. The authors of this article favor federal jurisdiction. They argue that Indian rights are qualitatively different from other reserved rights in that they protect a people and that they are private, instead of public, rights. Further, these rights are impliedly held in trust for the Indians by the federal government. It is longstanding policy that Indians should be free of state jurisdiction except in limited circumstances, precisely because of the historic power struggle between tribes and states. In such a context, state court neutrality is reasonably questioned. (Baumbach-Florida)

W78-11169

**INSTITUTIONAL ALTERNATIVES FOR MANAGING GROUNDWATER RESOURCES: NOTES FOR A PROPOSAL,**  
Arizona Univ., Tucson. School of Law.  
R. E. Clark.  
Natural Resources Journal, Vol. 18, No. 1, p 153-161 (January, 1978).

Descriptors: \*Water management (Applied), \*Comprehensive planning, \*Groundwater resources, \*International waters, Groundwater availability, Regulation, Permits, Management, Water quality standards, Water conservation, Mexico, Governmental interrelations.

The states of Arizona, New Mexico, California and Texas are the heaviest users of groundwater in the United States. Each of these states has a different system of groundwater law; none has adequate legislation for the protection and management of diminishing supplies within the state and along border areas. The shortage of groundwater in the boundary region between Mexico and the United States intensifies the need for joint management and conservation of their shared groundwater resources. This article proposed, within the framework of the Mexico-United States Treaty and the functions of the International Boundary and Water Commission, a regulatory and administrative approach to the problem. The authors recommended that withdrawals be measured and recorded, that flexible allocation procedures—such as permit systems—be instituted, and that the International Boundary and Water Commission be vested with the necessary administrative authority. Specifically recommended action included: (1) a joint research program to inventory groundwater supplies and detail the areas of availability and present uses; and (2) a goal of annual reports for use in land use planning and for industrial and other development. (Baumbach-Florida)

W78-11170

**THE MANAGEMENT OF WATER-LAND-ENVIRONMENTAL RESOURCES AT INTERNATIONAL BOUNDARY REGIONS,**  
Cornell Univ., Ithaca, NY. Center for Environmental Research.  
L. B. Dworsky.  
Natural Resources Journal, Vol. 18, No. 1, p 143-151 (January, 1978).

Descriptors: \*International Boundary and Water Commission, \*Mexico, \*Coordination, \*Water resources, Federal government, Comprehensive planning, Administration, Decision making, Management, Resources development, Future planning (Projected).

This article outlines some alternatives for improving the management of water, land, and environmental resources located in the boundary region of the United States-Mexico border. The author examines the current forces for change in the physical world and considers whether existing governmental institutions, such as the International Boundary and Water Commission (Commission), are equipped to cope with these changes. The author concludes that the United States and Mexico should establish a Joint Center for the Commission that would have authority to centralize the planning activities of the boundary region and develop a 'watching brief' over the land, water, and environmental matters within that region. The Joint Center would be vested with authority to advise the two countries on courses of action to be taken in response to the problems developed in the 'watching brief.' The author further recommends that a collaborative 'shadow' entity staffed by academic personnel be established for an initial five-year period to cooperate with and facilitate the activities of the Joint Center. (Anderson-Florida)

W78-11171

**MINERAL RESERVATION IN LAND PATENTS ISSUED UNDER STOCK-RAISING HOMESTEAD ACT OF 1916 HELD TO INCLUDE GEOTHERMAL RESOURCES—UNITED STATES V. UNION OIL COMPANY OF CALIFORNIA,**  
D. Fogarty.  
Gonzaga Law Review, Vol. 13, No. 1, p 240-248 (Fall, 1977).

Descriptors: \*Federal reservations, \*Mineral water, \*Water rights, \*Thermal water, Thermal springs, Mineral industry, Energy, Legal aspects, Judicial decisions, Land tenure, Relative rights.

In *United States v. Union Oil Company of California*, the United States brought action to preserve its reserved right to "all coal and other minerals; as provided for in the 1916 Stock-Raising Homestead Act under which defendants' predecessors were granted the land in question. The question on appeal was whether geothermal resources were encompassed as a reserved mineral. In holding that the geothermal resources were reserved, the court reasoned that: (1) many elements of a geothermal resources system can be classified as minerals; (2) in 1970 Congress specifically included geothermal resources in future mineral reservations; and (3) the established rule of construction in land grant cases is to resolve for the government on questions of what was conveyed. In determining the latter issue, the appeals court looked to the intent and legislative history of the Stock-Raising Homestead Act. The court held that the land grants were meant to provide homesteaders with a portion of the public domain sufficient for raising livestock, and to reserve unrelated subsurface resources—particularly energy sources—for separate disposition. Defendant oil company has appealed this Court of Appeals ruling to the Supreme Court. (Baumtack-Florida) W78-11172

#### APPLICATION OF FEDERAL COMMON LAW OF PUBLIC NUISANCE TO INTRASTATE STREAM POLLUTION—COMMITTEE FOR CONSIDERATION OF JONES FALLS SEWAGE SYSTEM V. TRAIN, C.G. Kroch.

Boston College Industrial and Commercial Law Review, Vol. 18, No. 5, p 929-955 (June, 1977).

Descriptors: \*Common law, \*Constitutional law, \*Federal jurisdiction, \*Pollution abatement, Environment, Federal government, Judicial decisions, Legal aspects, Streams, Water pollution, Water pollution control, Federal-state water rights conflicts.

The case of *Committee for Consideration of Jones Falls Sewage System v. Train* presented the question of whether the federal common law of nuisance could be applied in a suit by private individuals seeking to abate pollution of an intrastate stream. The majority in *Jones Falls* ruled that the federal common law of nuisance applied only to those cases seeking the abatement of public nuisance in interstate controversies where the complainant is a state and the offenders are creating extraterritorial harm. However, the majority view appears to be an improper restriction upon the use of the federal common law of public nuisance. In light of the federal government's interest in "navigable waters", as evidenced in numerous pieces of legislation. The decision in *Jones Falls* does not place a state in the untenable position of fulfilling its responsibility under the Federal Water Pollution Control Act, only to discover itself open to suit by private parties in the federal courts. The decision does strike a blow against environmental enforcement, in that a suit would be difficult to maintain in light of the available state defense that defendant was following federal law. (Jordan-Florida) W78-11173

#### SOIL AND WATER CONSERVATION.

Fla. Stat. secs 582.01 through 582.49 (1977).

Descriptors: \*Florida, \*Water conservation, \*Soil conservation, \*Legislation, Adoption of practices, Erosion control, Natural resources, Administration, Flood control, Waste water disposal, Navigable waters, Water resources development.

The 1977 Soil and Water Conservation Act (SWCA) was intended by the Florida legislature to implement four major policy goals: (1) prevention of floodwater damages; (2) furthering the conservation, development and utilization of soil and water resources; (3) disposal of water to preserve

natural resources, control floods, and prevent impairment of dams and reservoirs; and (4) assist in maintaining the navigability of rivers and harbors. The SWCA provides for the formulation of a Soil and Water Conservation Council, to be composed of five members of the state's farming community. The Council is basically required to advise the Department of Agriculture in connection with the promulgation, administration and enforcement of all laws and regulations relating to soil and water conservation. The SWCA also provides for the creation of soil and water conservation districts which will constitute a governmental subdivision of the state. These districts will carry the real burden of soil and water conservation work, including research and dissemination of information, carrying out of preventive and control measures, purchasing land, and adoption of land use regulations. Each districts actions will be reviewable by the appropriate county court. (Stump-Florida) W78-11174

#### FLORIDA AQUATIC PRESERVE ACT.

Fla. Stat. secs. 258.35 through 258.46 (1977).

Descriptors: \*Florida, \*Conservation, \*Water resources, \*Legislation, Aquatic environments, Estuaries, Ecology, Wetlands, Aquatic plants, Aquatic habitats, Aquatic life, Preservation.

The 1975 Florida Aquatic Preserve Act (Act) designates as preserves or sanctuaries state-owned submerged lands in areas which have exceptional biological, aesthetic and scientific value. The Act describes 31 preserves, all of which are characterized as being one or more of the following types: (1) biological: set aside to promote certain forms of animal or plant life or their habitats; (2) aesthetic: set aside to maintain certain scenic qualities or amenities; or (3) scientific types: set aside to maintain certain quality features which have scientific value or significance. The aquatic preserves established under the Act include only lands or water bottoms owned by the state or water bottoms; all lands lost by avulsion or by artificially induced erosion; or publicly owned and maintained navigation channels. The Act also provides for the establishment of new aquatic preserves, maintenance of the preserves and for the enforcement of the Act. (Stump-Florida) W78-11175

#### ADDITIONS TO LAND ACQUISITION TRUST FUND ACT (AUTHORITY TO CONVEY SUBMERGED LAND).

Fla. Stat. secs. 253.12-253.665 (1977).

Descriptors: \*Florida, \*Water resources development, \*Wetlands, \*Internal waters, Administrative agencies, Beds, Dredging, Legal aspects, Regulation, Water law, Project planning, Ownership of beds.

Except for submerged lands already conveyed by deed or statute, the title to all sovereignty tidal and submerged bottom lands is vested in the Board of Trustees of the Internal Improvement Trust Fund. For the purpose of dredge and fill restrictions, the Board shall exercise the same authority over submerged lands owned by the state by the right of its sovereignty in navigable freshwater lakes, rivers and streams as it does over other submerged land. All bulkhead lines are established at the line of mean high water or ordinary high water. No person shall dredge or fill beyond the bulkhead line without a permit from the Board. The Board of Trustees may sell and convey submerged land if determined by the Board to be in the public interest, and upon such prices, terms and conditions as it sees fit. However, prior to such sale, the Board must determine to what extent the sale of such submerged land would interfere with the conservation of fish, marine and other wildlife, or other natural resources. (Jordan-Florida) W78-11176

#### BOCA CIEGA BAY AQUATIC PRESERVE; BISCAYNE BAY AQUATIC PRESERVE.

Fla. Stat. secs. 258.16-258.165 (1977).

Descriptors: \*Florida, \*Bays, \*Conservation, \*Parks, Dredging, Landfills, Legal aspects, Legislation, Oceans, Preservation, State governments, Water law.

Boca Ciega Bay and Biscayne Bay are herein designated and established as aquatic preserves. It is the intent of the legislature that both bays be preserved in an essentially natural condition so that their biological and aesthetic values may endure for the enjoyment of future generations. The preserves shall include submerged bottom lands, the water column upon such lands, and the islands owned by the state within the boundaries of the preserve. No further dredging or filling of submerged lands in the preserve shall be tolerated by the Board of Trustees of the Internal Improvement Fund, except: (1) such minimum dredging as may be authorized for public navigation projects; (2) such other alterations as may be necessary to enhance the quality or utility of the preserves; (3) such dredging as is necessary for the elimination of hazardous conditions; and (4) such minimum dredging as may be authorized for the construction of marinas and their attendant navigation channels and access roads. Any dredging and filling shall be approved only after public notice and hearings in the area affected. (Jordan-Florida) W78-11177

#### FLORIDA SAFE DRINKING WATER ACT.

Fla. Stat. secs. 403.850-403.864 (1977).

Descriptors: \*Florida, \*Potable water, \*Public health, \*Regulation, Legislation, Standards, Water quality, Water supply, Water treatment, Water users, Water works, Municipal water.

It is state policy that citizens of Florida shall be assured of the availability of safe drinking water. The state Department of Environmental Regulation (DER) shall adopt and enforce state primary drinking water regulations that shall be no less stringent at any given time than the complete interim or revised national primary drinking water regulations in effect at such time. The state Department of Health and Rehabilitative Services shall establish and maintain laboratories for the conducting of radiological, microbiological, and chemical analysis of water samples from public water systems. Any duly authorized representative of either department may enter, take water samples from, and inspect any property, premises, or place on or at which a public water system is located, at any reasonable time, for the purpose of ascertaining compliance with the law. Both departments shall adopt an adequate plan for the provision of safe drinking water under emergency conditions. Upon receipt of information that a contaminant present in a public water system may present a danger to public health, DER may take such actions as it deems necessary to protect the public health. (Jordan-Florida) W78-11178

#### YELLOWSTONE RIVER COMPACT.

N.D. Cen. Code Ann. secs 61-23-01 through 61-23-02 (1960).

Descriptors: \*North Dakota, \*River basin development, \*Water supply, \*Interstate compacts, Wyoming, Montana, Water resources development, Drainage systems, Flood control, Watershed management, Interstate rivers, Tributaries.

The North Dakota legislature ratified the Yellowstone River Compact in 1950. Enacted into the laws of Montana and Wyoming also, the compact attempts to alleviate controversies between the states arising with respect to the Yellowstone River and its tributaries. The compact: provides



## Field 6—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

for an equitable division and apportionment of basin waters; encourages the beneficial development and use of the basin's waters; and, acknowledge that future projects or programs affecting the regulation, control or use of basin waters shall recognize the importance of water for irrigation purposes in the signatory states. Included in the compact is a schedule for allocation of unused and unappropriated waters of the interstate tributaries of the Yellowstone River. The compact recognizes all existing rights to the beneficial use of waters of the Yellowstone River, excludes certain uses (such as domestic and stock water uses) from control by the compact, and expressly states that nothing in the compact shall be construed or interpreted so as to adversely affect any rights to the use of the waters of the Yellowstone River by the Indians, their tribes and reservations. (Stump-Florida) W78-11179

#### ARTESIAN WELLS.

N.D. Cen. Code Ann. secs 61-20-01 through 61-20-08 (1960), as amended (Supp. 1977).

Descriptors: \*Artesian wells, \*North Dakota, \*Groundwater basins, \*Administrative agencies, Wells, Aquifers, Regulation, Well data, Well permits, Legislation, Phreatic lines, Water supply.

Amendments to Chapter 61-20 of the 1977 North Dakota Statutes prescribe the duties of the state water commission. The Commission is generally charged with the duty of advising state citizens as to the practicability of measures affecting the state citizens as to the practicability of measures affecting the state's underground waters. The Commission is also specifically required to: (1) counsel owners on the most desirable control and use of their wells; (2) make a record of well flows and pressures to learn about the fluctuations and permanence of the artesian supply; (3) record and keep for public reference certain details of the character of water and construction and history of wells; (4) enforce all laws pertaining to artesian wells; and (5) publish bulletins containing necessary information concerning artesian wells and the state's phreatic waters. Prior to these amendments, these duties were handled by the state geologist. The statute also requires valves on all artesian wells by which the flow is controlled, and generally allows only as much flow as is necessary for ordinary use by the owner. The statute makes provisions for clogged wells and wild wells, and schedules penalties for violations of the statute. (Stump-Florida) W78-11180

**PEOPLE OF THE STATE OF NEW YORK V. BONDI (UNLESS MARSH OR WETLAND IS ON FINAL STATE WETLANDS MAP, IT IS NOT SUBJECT TO STATE ENVIRONMENTAL CONSERVATION LAW RESTRICTIONS).** 404 N.Y.S. 2d 521-524 (1978).

Descriptors: \*New York, \*Wetlands, \*Land classification, \*Water conservation, Freshwater, Permits, Regulation, Legal aspects, Water policy, Mapping, Land use.

Plaintiff state of New York filed an application to reargue dismissed charges against defendant landowner. The state claimed the defendant owned wetlands subject to the state's Environmental Conservation Law (statute) and had altered them without an appropriate permit. The defendant contended that his lands had never been mapped in accordance with the statute, and therefore were not subject to the rules prescribed by the statute. The court ruled that although included on a preliminary map, defendant's land had never been officially mapped and included within protected areas on the final state Fresh Water Wetlands Map mandated by the statute. The state also charged defendant with activity prohibited by the statute—specifically bulldozing cattails and covering them with dirt.

The court ruled that because the state failed to allege or show that the bulldozing was not conducted for the purpose of growing agricultural products—an exclusion to regulated activities under the statute—the initial dismissal of charges would be affirmed. (Stump-Florida) W78-11181

#### CONTROL, PREVENTION, AND ABATEMENT OF POLLUTION OF SURFACE WATERS.

N.D. Cen. Code Ann. secs 61-28-01 through 61-28-18 (Supp. 1977).

Descriptors: \*North Dakota, \*Water pollution control, \*Surface waters, \*Administrative agencies, Legislation, Pollution abatement, Water quality control, Waste treatment, Water quality standards, Regulation, Penalties (Legal).

Chapter 61-28 of the North Dakota Code was enacted to give the state power to control, prevent, and abate the pollution of surface waters in North Dakota. The statute specifically prohibits the pollution of or discharge of any wastes into state waters. The state Water Pollution Control Board (Board), acting jointly with the state health council, has authority to adopt, amend, or repeal rules and standards pertaining to the quality of state waters. While the Board also fixes penalties for violations, it does not give sufficient owner status to the state to support a civil action for damages against one who unlawfully pollutes a stream and thereby causes the destruction of fish. The Board consists of heads of the departments of health, water conservation, and game and fish, the state geologist and six citizens—representing municipal, industrial, wildlife and agricultural interest—who are appointed by the governor. The Board is charged with supervision and development of comprehensive programs for the prevention, control and abatement of water pollution. Specific guidelines, powers and duties are delegated to the Board. (Stump-Florida) W78-11182

#### WATER CONSERVATION.

N.D. Cen. Code Ann. secs 61-15-01 through 61-15-10 (1960), as amended (Supp. 1977).

Descriptors: \*Legislation, \*Water policy, \*North Dakota, \*Water conservation, Water permits, Water rights, Civil law, Governments, Regulation, Legal aspects, Permits, Planning.

Chapter 61-15 of the North Dakota Code codifies the state policy in regard to control and supervision of water and wildlife conservation projects. The law vests power in the state to control navigable lakes, which are defined as those having been meandered and whose metes and bounds have been established by the government of the United States in a public lands survey. Actual authority is vested in the state engineer, who may accept aid from the federal government. The law also includes a specific provision for the state engineer to take necessary action to conserve and rehabilitate water levels in the Turtle Mountain region of the state. Municipalities are given specific permission to construct dams across a certain portion of the Red River. In 1977, the law was amended and section 61-15-04, which originally mandated that necessary easements be granted to the United States, now makes such grants optional. Section 61-15-07, which provided that the value of land shall not be diminished by conservation projects carried out on it, was repealed in 1977. A third amendment changed the penalty for draining a meandered lake. (Stump-Florida) W78-11183

#### GENERAL RULES GOVERNING IRRIGATION.

N.D. Cen. Code Ann. secs 61-14-01 through 61-14-15 (1960), as amended (Supp. 1977).

Descriptors: \*North Dakota, \*Irrigation, \*Water rights, Legislation, Irrigation permits, Regulation, Water distribution (Applied), Irrigation canals, Irrigation ditches, Irrigation practices.

Chapter 61-14 of the North Dakota Code prescribes general rules, including definitions and penalties, governing irrigation in the state. Water not used beneficially by the party entitled to its use for a three-year period reverts to the states. The amount of water that may be appropriated for irrigation shall not exceed the rate of one cubic foot per second for each 80 acres, for a specified time in each year. Water use rights remain appurtenant to the land, but if beneficial or economic use becomes impracticable, the water rights may be severed from the land and attached to other land upon approval of the state engineer. The statute includes a requirement for the construction and maintenance of a headgate where water is diverted and provides a penalty for violation. The statute also regulates bridges over ditches and canals, liens on land, seepage water, and disposition of state lands. The 1977 Supplement to the statute provides authority for the state engineer to allow a higher rate of diversion for irrigation, repeals the section declaring water rights appurtenant to the land, and changes the penalty schedule. (Stump-Florida) W78-11184

#### STATE OF WASHINGTON V. UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (VALID EFFLUENT GUIDELINES NECESSARY FOR EPA AUTHORITY).

573 F. 2d 583-592 (9th Cir. 1978).

Descriptors: \*Permits, \*Waste disposal, \*Industrial wastes, \*Washington, Administrative agencies, Federal government, Federal Water Pollution Control Act, Pulp wastes, Sulfite liquors, Water pollution, Water quality, Standards.

Plaintiffs state of Washington and Scott Paper Company sought injunctive relief against federal Environmental Protection Agency's (EPA) veto of a state discharge permit. The permit had been issued by the state to the company for discharge of paper mill wastes into Puget Sound. After a jurisdictional problem was resolved, the trial court held that the EPA had no valid basis to veto the state permit. The EPA's veto power over state discharge permits is contingent on the antecedent formulation of effluent limitation guidelines in the form of regulations promulgated in conformity with rule-making provisions of the federal Administrative Procedures Act. Absent such legitimate regulations, the achievement of effluent reductions through application of the best possible technology is not one of the 'requirements of the Act' within the meaning of the statute. The veto based on the ad hoc determination of what constituted the best possible technology for the plant and not on uniform effluent limitations standards expressed on an industrywide basis was invalid because Congress did not intend to deprive permit applicants the procedural opportunity to participate in the formulation of administrative guidelines and regulations. (Jordan-Florida) W78-11185

#### STATE WATER CONTROL BOARD V. HOFFMAN (FEDERAL JURISDICTION OVER HISTORICALLY NAVIGABLE WATERS).

574 F. 2d 191-194 (4th Cir. 1978).

Descriptors: \*Navigable waters, \*Virginia, \*Lakes, \*Rivers and Harbors Act, Administrative agencies, Interstate rivers, Navigable rivers, Permits, Regulation, Water control, Federal jurisdiction, Water resources development.

In a suit requesting injunctive relief, the Virginia Water Control Board challenged the jurisdiction of the U.S. Army Corps of Engineers over a small, artificial lake under the Rivers and Harbors Act.

The Act requires a permit from the Corps for the placing of any structure in a navigable water of the United States. The Virginia board contended that the lake—which was created in 1964 by impounding waters of the Upper Roanoke River—was exempt from the permit requirement, because of a 1976 Amendment to the Act which exempted bodies of water considered navigable solely on the basis of historical use in interstate commerce. The Corps argued that the lake could also be considered navigable based on its present navigational capability. The Fourth Circuit Court of Appeals held that the lake was exempt from the Act's permit requirement. The court stated that the lake was precisely the type of lake that Congress intended to exempt from the permit requirement. The court declared that there was no evidence which would support a finding of navigability of the lake based upon its present capability. (Jordan-Florida) W78-11186

**INLAND STEEL COMPANY V. ENVIRONMENTAL PROTECTION AGENCY (CURRENT PERMIT CAN INCLUDE CONDITION THAT SUBSEQUENTLY ADOPTED DISCHARGE STANDARDS WILL BE APPLICABLE TO DISCHARGER).**  
574 F.2d 367-374 (7th Cir. 1978).

Descriptors: \*Industrial wastes, \*Permits, \*Toxicity, \*Water pollution, \*Treatment, Administrative agencies, Federal government, Federal Water Pollution Control Act, Standards, Waste water, Water law, Water pollution, Waste treatment.

The steel company petitioned for a review of an Environmental Protection Agency permit which allowed the steel company to discharge pollutants in waste water, but reserved the right to modify the permit to reflect subsequently adopted toxic pollutant standards. The steel company argued that such a reservation was beyond the EPA's power. The seventh circuit court of appeals held that the reservation was within EPA's power and upheld the permit. The court stated that Congress did not intend to deny the EPA the power to include in a permit a provision authorizing discharge modifications reflecting more stringent, subsequently adopted standards. EPA could choose to issue permits of extremely short duration, and thus assure that any new toxic pollutant standard would be complied with quickly. Having given the EPA this power, Congress would have had no reason to withhold the authority claimed in this case. The court went on to say that the EPA is given broad discretion to choose the means by which to implement the Act. EPA is authorized to prescribe such regulations as are necessary to carry out its functions. (Jordan-Florida) W78-11187

**OMAHA INDIAN TRIBE, TREATY OF 1854 WITH THE UNITED STATES V. WILSON (TITLE TO RESERVATION LAND AS AFFECTED BY A CHANGE IN THE COURSE OF A BOUNDARY RIVER).**  
575 F.2d 620-651 (8th Cir. 1978).

Descriptors: \*Accretion (Legal aspects), \*Avulsion, \*Missouri River, \*Boundary disputes, Bank erosion, Boundaries (Property), Federal jurisdiction, Interstate rivers, Reliction, Indian reservations, Navigable rivers, Thalweg.

An 1854 treaty created an Indian reservation on certain lands located west of the main channel of the Missouri River. By 1923, the river had moved more than two miles to the west of the original boundary line. The plaintiff Indians contended that the doctrine of avulsion applied and that the boundary line remained at the 1854 location. The defendants asserted that early movements of the river had completely washed away the reservation land, and that the land now within the former boundary was soil which had accreted to Iowa

riparian land. The trial court decided in favor of the defendants on the basis of Nebraska law. The Eighth Circuit Court of Appeals reversed the district court on the grounds that federal law should have been applied to decide a boundary dispute involving interstate boundaries. Under federal law, non-Indians are required to assume the burden of proof to show that Indians no longer have lawful title to reservation land. The court held that the defendants' evidence was too speculative and uncertain to show that the reservation boundary had shifted by reason of accretion. (Jordan-Florida) W78-11188

**OIL SPILLS: THE POLICY OF PREVENTION AND THE STRATEGY OF RECOVERY.**  
Massachusetts Univ., Amherst. Dept. of Food and Resource Economics.  
For primary bibliographic entry see Field 5G.  
W78-11205

**SOME POLITICAL-INSTITUTIONAL FACTORS AFFECTING EFFORTS TO CONSERVE WATER IN WASHINGTON STATE.**  
Washington State Univ., Pullman. Dept. of Political Science.  
R. D. Davies, and B. A. Haines.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 038. Price codes: A05 in paper copy, A01 in microfiche. Washington Water Research Center, Pullman, June 1978. 71 p., 2 fig., 10 tab., 34 ref., 12 append. OWRT A-090-WASH(1), 14-31-0001-7101.

Descriptors: \*Alternative planning, Institutions, Legal aspects, Decision making, \*Political constraints, \*Washington, \*Water conservation, \*Institutional constraints, \*Attitudes, Social values.

The legal doctrine that use of water must be reasonable has been interpreted recently by courts to proscribe some relatively common wasteful practices in the west. However, it is difficult for courts to provide the kind of broad, prospective, informed and sustained efforts to counteract waste that would be possible through administrative mechanisms. The extent to which administrative mechanisms are adopted and successfully implemented depends in part on support and opposition from water users and those who represent them. In this study relevant perceptions and attitudes of individuals interested and/or influential in Washington state water policy were surveyed by means of a mailed questionnaire. Most respondents agreed that water was becoming more scarce, and the principal causes of scarcity were felt to be insufficient precipitation, deficient storage, inadequate monitoring, lack of governmental planning and regulation, and wasteful practices by agricultural, municipal/domestic and industrial users. Respondents were most supportive of proposals to (1) institute voluntary programs for improving conservation, and (2) impose negative incentives on users who waste water. The lease support was given to proposals for positive incentives to encourage more efficient practices. Attitudes and perceptions of respondents from non-profit, development-oriented associations were closer to those of state officials than to the profit-makers whom they represented. This suggests that efforts to promote conservation may be more effective if associations of water users are encouraged to participate more actively in them. W78-11212

**THE EFFECTS OF THE USE AND REGULATION OF SEPTIC TANK SYSTEMS UPON LAND USE IN MASSACHUSETTS.**  
Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning.  
For primary bibliographic entry see Field 5G.  
W78-11216

**PROBLEMS IN ATTEMPTING TO TRANSLATE STATUTORY STANDARDS INTO EMISSION LIMITATIONS UNDER AIR AND WATER POLLUTION CONTROL LEGISLATION.**  
Yeshiva Univ., New York. School of Law.  
For primary bibliographic entry see Field 5G.  
W78-11240

**SUMMARY, NEW HAMPSHIRE WATER QUALITY STANDARDS.**  
New Hampshire Water Supply and Pollution Control Commission, Concord.  
For primary bibliographic entry see Field 5G.  
W78-11241

**ENVIRONMENTAL POLICY STANDARDS.**  
De Kalb County, Georgia, Code, Chapter 6A, Supplement 12 (1975).

Descriptors: \*Georgia, \*Local governments, \*Conservation, \*Land development, Regulation, Environmental effects, Penalties (Legal), Standards, Flood control, Erosion control, Drainage, Permits.

All persons proposing new development or construction within DeKalb County (Georgia) after June 11, 1974, shall submit to the development director a site plan illustrating the means of conformance with the policy provisions set forth in this county ordinance and illustrating compliance with applicable development standards established by this ordinance. In addition, such persons shall be required to furnish bond or other financial security necessary to insure installation of required structures. The development director or the roads and drainage director (Directors) may inspect any development commenced after June 11, 1974, to determine compliance with the standards of this ordinance and may issue a notice of violation to the property owner, or, if the Directors determine that the violation is willful and hazardous to the public, they may issue a court summons. After notice of violation, if compliance is not obtained within the time designated by the Directors, summons shall be issued for the owner to appear in recording court. Public policies of DeKalb County and specific development standards for grading, vegetation protection, erosion and sedimentation control, and drainage are also set forth in the ordinance. (Anderson-Florida) W78-11243

**WATER PROBLEMS IN THE RURAL ENVIRONMENT--ALTERNATIVE SOLUTIONS FOR WATER SUPPLY AND WASTEWATER DISPOSAL.**  
For primary bibliographic entry see Field 3F.  
W78-11244

**SUPREME COURT DECLARES STATE LAW CONTROLS RIVERBED TITLE ISSUES.**  
Environmental Law Reporter, Vol. 7, No. 3, p. 10045-10047 (March, 1977).

Descriptors: \*Judicial decisions, \*Navigable rivers, \*Ownership of beds, \*Federal-state water rights conflicts, Riparian rights, Navigable waters, Legal aspects, Beds under water, Federal jurisdiction, Water policy, State jurisdiction, Rivers.

The United States Supreme Court overturned a three-year-old decision and declared that ownership disputes concerning beds of interstate navigable waters must be decided as a matter of state law rather than federal common law. The recent decision concerned an attempt by the state of Oregon to eject a sand company from parcels it had been mining for more than 40 years. The parcels were not part of the riverbed when Oregon was admitted to the Union, but became part of the river's main channel after a gradual shift in course resulting from high water stages and a flood. Oregon courts, following federal common law principles,

## Field 6—WATER RESOURCES PLANNING

### Group 6E—Water Law and Institutions

held that the mining company owned the land, and that the state's right could be served by assent of a navigation servitude. The Supreme Court reversed, retracting its earlier assertion of continuing federal interest in navigable, intrastate riverbeds. The implications of this position on the federal level are not certain. Federal lands bordering rivers are now subject to state riparian rules, which may affect the scope and nature of federal water projects. (Rule-Florida)  
W78-11245

**INTERIOR'S FAILURE TO COMPLY WITH NEPA BLOCKS ATLANTIC OCS OIL LEASING.** Environmental Law Reporter, Vol. 7, No. 4, p 10067-10070 (April, 1977).

Descriptors: \*Atlantic Ocean, \*Oil industry, \*Exploration, \*Judicial decisions, Legislation, Continental shelf, Environmental effects, Natural resources, Regulation, Adjudication procedure, Energy, Water quality control.

A recent federal district court ruling voided the first sale of outer continental shelf oil and gas exploration and production leases for areas off the Atlantic coast because the final environmental impact statement inadequately complied with National Environmental Policy Act requirements. The court had earlier issued a preliminary injunction against the opening of bids for the lease sale, but is was stayed by the Second Circuit Court of Appeals because of the national interest in increasing domestic energy supplies, and because there would be no irreparable harm from simply opening the bids. The effect of the recent district court decision has been stayed pending completion of the appeal process. However, the district court decision was based on findings of fact which the court of appeals must accept as presumptively valid, so the decision may be difficult to reverse. Unless the Interior Secretary can show that the impacts of adverse state and local regulation can be accommodated, the decision to appeal will place the Interior in a position of arguing that outer continental shelf development must take place regardless of economic cost or the disruption of state and local regulatory structures. (Rule-Florida)  
W78-11246

**PRATHER V. EISENMANN (IRRIGATION WATER USER LOWERING WATER TABLE LIABLE FOR DAMAGES TO ADJACENT DOMESTIC WELL OWNERS).** 261 N.W.2d 766-772 (Neb. 1978).

Descriptors: \*Water wells, \*Water level fluctuations, \*Penalties (Legal), \*Nebraska, Aquifer management, Water supply, Irrigation effects, Reasonable use, Water demand, Groundwater availability, Irrigation wells, Pumping.

Plaintiffs, domestic well owners, brought action to enjoin defendant from pumping groundwater from an irrigation well. Plaintiffs lost the use of their domestic wells soon after defendant began pumping water from the irrigation well at the rate of 650 gallons per minute. Tests made by hydrologists showed that the irrigation well and the domestic wells were drawing from the same aquifer, which could be defined with reasonable scientific certainty, and that defendant's pumping depressed the artesian head of the domestic wells. Further, the cone of influence caused by defendant's pumping intercepted of affected the plaintiffs' wells, and to obtain water from their wells during periods when defendant was pumping, the plaintiffs would have to pump water from the top of the shale. The Nebraska Supreme Court affirmed a district court decision for the plaintiffs, and held that by operating an irrigation well in such a manner so as to render the plaintiffs' domestic wells useless during the pumping period, defendant was liable for necessary and reasonable expenses to restore the wells by lowering the plaintiffs' pumps to shale. (Rule-Florida)

W78-11247

#### GUIDELINES FOR PREPARATION OF WATER QUALITY MANAGEMENT PLANS.

Environmental Protection Agency, Washington, DC. Office of Water and Hazardous Materials. For primary bibliographic entry see Field 5G.  
W78-11249

#### FREEDOM OF RESEARCH AT SEA SLIPPING AWAY.

Woods Hole Oceanographic Institution, MA. P. M. Fye. Sea Technology, Vol. 8, No. 6, p 10-14 (June, 1977).

Descriptors: \*Law of the sea, \*United Nations, \*Oceanography, \*Foreign research, International law, Oceans, Foreign countries, Project planning, Economic impact, Research and development, Exploitation, Exploration.

Responding to questions regarding growing restrictions on oceanographic research, the author of this article discusses the necessity for a maximum oceanic research effort. When the 200-mile economic zone was being considered for inclusion in the United Nations Law of the Sea Conference Treaty, many developing nations argued that anyone wishing to do research within the economic zone must first obtain the consent of the neighboring coastal state. These countries viewed oceanography as a tool of military domination and industrial exploitation that would not contribute to solutions of their respective economic problems. However, the author makes clear that vigorous scientific programs carried out cooperatively by many nations working together and sharing results will benefit all mankind, particularly by providing a basis for good management of fisheries, allocating other marine resources, and in gaining an understanding of the oceans' effect on weather and climate. The author reviews several strategies designed to persuade developing nations of the fact that oceanographic research will be useful to them, and concludes by calling for a dramatic drive to reduce the restrictions on oceanographic research. (Stump-Florida)  
W78-11250

**CONSERVATION DISTRICTS AND 208 WATER QUALITY MANAGEMENT, NON-POINT SOURCE IDENTIFICATION AND ASSESSMENT; SELECTION OF BEST MANAGEMENT PRACTICES; MANAGEMENT AGENCIES; REGULATORY PROGRAMS.** National Association of Conservation Districts, Washington, DC. For primary bibliographic entry see Field 5G.  
W78-11251

**FEDERAL PLAN FOR THE ACQUISITION OF WATER DATA--FISCAL YEARS 1978 AND 1979.** Geological Survey, Reston, VA. Water Resources Div. For primary bibliographic entry see Field 7C.  
W78-11267

**THE RELATIONSHIP OF 'SPARTINA ALTERNIFLORA' TO MEAN HIGH WATER.** State Univ. of New York at Stony Brook. Marine Sciences Research Center. For primary bibliographic entry see Field 2L.  
W78-11300

### 6F. Nonstructural Alternatives

**THE VIRGINIA COAST RESERVE: ACQUISITION STRATEGIES FOR COASTAL ZONE PRESERVATION.** Nature Conservancy, Arlington, VA. P. F. Noonan.

Coastal Zone Management Journal, Vol. 3, No. 4, p 405-17, 1977.

Descriptors: \*Conservation, \*Virginia, \*Seashores, \*Barrier Islands, \*Coasts, Land management, Land resources, Natural resources, Protection, Coastal marshes, Regions, Land development, Land use, Recreation, Preservation, Wetlands, Zoning, Islands, Easements, Regulation, Atlantic coastal plain.

Preserving and protecting environmentally valuable natural lands is the basic purpose of The Nature Conservancy, a national conservation organization. As part of its program, it has acquired 13 of Virginia's Barrier Islands over the past seven years. The islands were threatened with development, which would have destroyed one of the last remaining natural seashore areas in the nation. Acquisition of the islands was either by outright purchase, or through donations from private individuals and philanthropists. Godwin Island, the first obtained, was purchased in a bargain sale, the seller receiving a 30% tax deduction. The purchase was prompted by a development firm's plan to turn three adjoining islands into a luxury resort complex. These three islands were later purchased by the Conservancy after the developer became convinced of the project's unfeasibility. At this point the Conservancy became determined to preserve the entire chain. It acquired the nine other islands with varying degrees of difficulty. Despite its success, the organization realizes that land acquisition is not always feasible. It proposes comprehensive coastal zone management programs, along with other strategies, to insure protection of these naturally valuable areas. (Malefatto-Florida)  
W78-10787

#### ENVIRONMENTAL PROTECTION: MODEL ORDINANCES FOR USE BY LOCAL GOVERNMENTS.

Metropolitan Council of the Twin Cities Area, MN. For primary bibliographic entry see Field 6E.  
W78-10801

**MODELLING THE DYNAMIC RESPONSE OF FLOODPLAINS TO URBANIZATION IN SOUTHEASTERN NEW ENGLAND.** Colorado State Univ., Fort Collins. Dept. of Earth Sciences. For primary bibliographic entry see Field 4C.  
W78-11064

**POLICY AND PROGRAM ANALYSIS OF AN OPEN LAND APPROACH TO FLOOD PLAIN MANAGEMENT.** Cornell Univ., Ithaca, NY. Center for Environmental Research.

J. P. Royer, B. T. Wilkins, and D. J. Allee. Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 930. Price codes: A07 in paper copy, A01 in microfiche. Completion Report, (August 1978). 125 p, 15 fig, 27 tab, 26 ref, 4 append. OWRB B-056-NY(1), 14-34-0001-7170.

Descriptors: \*Flood plains, \*Parks, \*Land use, Flood plain zoning, Recreation, Non-structural alternatives, \*New York, \*Community development, Land management, Water policy, Regional analysis, \*Susquehanna River Basin(NY), Benefits, Surveys, Attitudes.

The Nation's approach to flood problems has been changing in recent years: The trend is from reliance on structure and towards programs to influence the use of flood-prone land. Moreover, new emphases have been placed on environmental values and open land opportunities. A land use strategy frequently considered to simultaneously meet these needs is the acquisition and use of flood plains for parks, open space, and other non-



## Ecologic Impact Of Water Development—Group 6G

intensive uses. A case study of communities in the Susquehanna River Basin of southern New York was used to identify land use patterns important to a policy of acquiring flood-prone land, to examine the economic rationale for an open land approach, and to assess the political viability of an open land strategy. An inventory of flood-plain land-uses in 51 southern New York communities revealed a pattern of land use change related to community size. Based on this pattern, the small, but growing communities and the communities immediately upstream and downstream from major population centers were judged to be the most likely to benefit from flood plain acquisition. The flood plains in these communities were mostly in inactive agricultural and idle uses. Mailed surveys to heads-of-households in six communities and community officials in 13 communities showed regulatory measures for managing flood-plain use were widely supported and preferred to land acquisition. Support for acquisition was modest, but the use of flood plains for parks and open space was viewed as the best long-term use. Estimated benefits to households from the use of flood plains for parks were small and diffuse. But when considered in aggregate and projected over time, these benefits were enough to justify flood plain acquisition in some communities.

W78-11201

#### WASTEWATER MANAGEMENT PLANNING: SOURCES OF CONFLICT IN THE EVALUATION OF ALTERNATIVES,

Clark Univ., Worcester, Mass. Dept. of Environmental Affairs.

For primary bibliographic entry see Field 5G.

W78-11202

#### THE EFFECTS OF THE USE AND REGULATION OF SEPTIC TANK SYSTEMS UPON LAND USE IN MASSACHUSETTS,

Massachusetts Univ., Amherst. Dept. of Landscape Architecture and Regional Planning.

For primary bibliographic entry see Field 5G.

W78-11216

### 6G. Ecologic Impact Of Water Development

#### A COMPREHENSIVE METHODOLOGY FOR ASSESSING ENVIRONMENTAL IMPACT,

British Columbia Univ., Vancouver. Dept. of Soil Science.

M. W. Sondheim.

Journal of Environmental Management, Vol 6, No 1, p 27-42, January 1978. 2 fig, 4 tab, 28 ref.

Descriptors: \*Environmental effects, \*Environmental control, \*Methodology, \*Assessment, Dams, Projects, Rating, Multi-resources, Impact statements, Alternative planning, Equations, Water resources.

A methodology for assessing environmental impact is developed and tested. Advantages of this technique over other methods include: the ability to evaluate simultaneously a large number of project alternatives; the capability of incorporating directly a very broad definition of 'environment' in the assessment process; the segregation of the subjective components of the study; the possibility of including direct public participation in the assessment process; the use of interval or ratio rating schemes instead of ordinal ones; and the examination of specific potential impacts in the way(s) deemed most suitable. The methodology was devised in response to a problem involving whether or not a dam should be constructed at a given site; however, it should be noted that the methodology is applicable to a wide variety of situations. (Bell-Cornell)

W78-10652

#### FINAL REPORT, ENVIRONMENTAL IMPACT MODEL DEVELOPMENT FOR NAVAL OPERATIONS,

Naval Weapons Center, China Lake, CA. Public Works Dept.

J. R. Ouimette.

Available from the National Technical Information Service, Springfield, VA 22161, as AD-A015 288 Price codes: A03 in paper copy, A01 in microfiche. Final Report, NWC TP 5793, Naval Weapons Center, China Lake, California, August 1975. 28 p, 2 fig, 4 tab 52 ref.

Descriptors: \*Simulation analysis, \*Model studies, \*Environmental impact, Water pollution, Air pollution, Methodology, U.S. Navy, Cost effective, Systems analysis.

Simulation models are the most commonly used tools for relating residual emissions, such as air, water, and noise, to environmental quality. The model can be defined as a mathematical description of the transport, dispersion, and transformation processes that occur in a given medium. The role of the simulation model in the environmental impact process is to predict pollutant concentrations so that they can be related to impact on various ecosystem receptors. This report examines various air and water models and environmental impact methodologies to determine suitability for Navy needs. Certain models are recommended for Navy use to maintain a cost-effective information response system.

W78-10667

#### GUIDELINES FOR EPA REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS ON PROJECTS INVOLVING IMPOUNDMENTS,

Curran Associates, Inc., Northampton, MA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 725, Price codes: A07 in paper copy, A01 in microfiche. June, 1975, 120 p.

Descriptors: \*Environmental effects, \*Impoundments, \*Administrative agencies, \*Decision-making, \*Water resources development, Impounded waters, Reservoir construction, Detention reservoirs, Conservation, Coordination, Governments, Legal aspects, Legislation, Projects, Water management(Applied), Water policy, Water supply, Reservoirs, Planning, Regional development.

The Environmental Protection Agency (EPA) involvement in the impoundment process stems from the mandates of the National Environmental Policy Act of 1969 and the Clean Air Act Amendments of 1970. With the exception of highly controversial projects, the bulk of EPA impoundment project reviews has been and will continue to be conducted at the regional level. To adequately perform these reviews, each regional Environmental Impact Statement (EIS) Coordinator and his attendant review personnel must have the best available information on both the technical and procedural aspects of EIS reviews on these projects. This document provides the guidance necessary to properly review impoundment projects. The approach of the guidelines is one of unifying the various review and technical documents currently in use by placing them in the context of the impoundment project review process. Several review 'check lists' are provided and should be utilized to insure that all relevant areas have been reviewed. This report will be used as the draft version of the EPA guidelines for the review of EIS's on projects involving impoundments. (Beamer-Florida)

W78-10761

#### AN ANALYSIS OF THE SCOPE OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT ON THE GARRISON DIVISION UNIT PROJECT: APPLYING A TOTALITY OF CIRCUMSTANCES TEST,

P. Bossert.

North Dakota Law Review, Vol. 53, No. 3 p 427-48. 1977.

Descriptors: \*Missouri River, \*North Dakota, \*Reservoir construction, \*Multiple-purpose reservoirs, \*Multiple-purpose projects, Diversion structures, Environmental effects, Reclamation, Environment, Projects, Irrigation, Reservoirs, Flood control, Judicial decisions, Navigation, Wildlife, Recreation, Alternative planning, Administrative agencies, Evaluation.

Several reclamation projects are currently under way in the Missouri River Basin. One such project, the Garrison Diversion Unit in North Dakota, envisions construction of five multiple-purpose reservoirs on the Missouri River for flood control, navigation, irrigation, power, domestic and sanitary purposes, and wildlife and recreation. This article analyzes the scope of the final Environmental Impact Statement (EIS) completed by the Bureau of Reclamation in compliance with the National Environmental Policy Act of 1969. The statement has been criticized by federal agencies and public interest groups as being insufficient for failing to analyze the full scope of the project's environment impacts on the entire Missouri River Basin. To determine whether a segmented EIS such as the one prepared for the Garrison Diversion Unit is proper, the courts generally apply a 'totality of circumstances' test. This test analyzes the independent utility of a segment, the irretrievable commitment of resources to a segment, and the foreclosure of alternatives to a project caused by segmentation. The author concludes that two EIS's were in order here, one assessing broad effects and one detailing specific impacts. (Spector-Florida)

W78-10785

#### THE NEW FEDERAL WATER POLLUTION CONTROL ACT AND ITS IMPACT ON NUCLEAR POWER PLANTS,

Consolidated Edison Co. of New York, Inc., New York.

For primary bibliographic entry see Field 5G.

W78-10861

#### ENVIRONMENTAL DEFENSE FUND, INC. V. HOFFMAN (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT CHALLENGED),

For primary bibliographic entry see Field 6E.

W78-10867

#### SIERRA CLUB V. CAVANAUGH (REQUIREMENT OF ENVIRONMENTAL IMPACT STATEMENTS FOR CONSTRUCTION OF RURAL WATER SYSTEMS),

For primary bibliographic entry see Field 6E.

W78-10881

#### COUNTY OF SUFFOLK V. SECRETARY OF THE INTERIOR (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT),

For primary bibliographic entry see Field 6E.

W78-10886

#### ENVIRONMENTAL LAW ISSUES IN THE DEVELOPMENT OF ENERGY RESOURCES,

Texas Tech Univ., Lubbock. School of Law.

For primary bibliographic entry see Field 6E.

W78-11160

#### DREDGING IN ESTUARIES - A GUIDE FOR REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS. SYMPOSIUM/WORKSHOP PROCEEDINGS, MARCH 1977, RESTON, VIRGINIA,

Research Triangle Inst., Research Triangle Park, NC.; and Oregon State Univ., Corvallis.

For primary bibliographic entry see Field 2L.

W78-11222

## Field 6—WATER RESOURCES PLANNING

### Group 6G—Ecologic Impact Of Water Development

**SOCIOECONOMIC IMPACTS OF OUTER CONTINENTAL SHELF OIL AND GAS DEVELOPMENT-A BIBLIOGRAPHY.**  
Geological Survey, Reston, VA.  
M. L. Pattison.  
Circular 761, 1977, 66 p.

**Descriptors:** \*Bibliographies, \*Resources development, \*Environmental effects, Sites, Land use, Oil fields, Gases, Water pollution sources, \*Outer Continental Shelf, \*Socioeconomic impacts, Environmental impacts.

The bibliography lists reports which are concerned primarily with the socioeconomic impacts of OCS oil and gas development or which, although not primarily concerned with such impacts, include sections that contain significant discussion of them. Several of the cited reports do not address socioeconomic issues directly, but have been included because of their value in providing a broad picture of OCS oil and gas development and the associated terminology and/or technical aspects. (Sinha - OEIS)  
W78-11232

**INTERIM HIERARCHICAL REGIONAL CLASSIFICATION SCHEME FOR COASTAL ECOSYSTEMS OF THE UNITED STATES AND ITS TERRITORIES.**  
Fish and Wildlife Service Fort Collins, CO.  
For primary bibliographic entry see Field 2L.  
W78-11233

**DESCRIPTION OF MANGANESE NODULE PROCESSING ACTIVITIES FOR ENVIRONMENTAL STUDIES. VOLUME I: PROCESSING SYSTEMS SUMMARY.**  
Dames and Moore, Salt Lake City, UT.; and EIC Corp., Newton, MA.  
For primary bibliographic entry see Field 5C.  
W78-11239

**ENVIRONMENTAL POLICY STANDARDS.**  
For primary bibliographic entry see Field 6E.  
W78-11243

## 7. RESOURCES DATA

### 7A. Network Design

**FEDERAL PLAN FOR THE ACQUISITION OF WATER DATA--FISCAL YEARS 1978 AND 1979.**  
Geological Survey, Reston, VA. Water Resources Div.  
For primary bibliographic entry see Field 7C.  
W78-11267

### 7B. Data Acquisition

**AN INEXPENSIVE PRECIPITATION GAUGE,**  
New Mexico State Univ., University Park. Dept. of Agronomy.  
B. A. Buchanan, R. L. DeVelle, and N. S. Urquhart.  
Soil Science Society of America Journal, Vol 42, No 3, p 532-533, May-June 1978. 2 fig, 2 ref.

**Descriptors:** \*Rain gages, \*Design, \*Equipment, Precipitation (Atmospheric), Rainfall, Measurement, Instrumentation, Gages, Gaging, Arid lands, Meteorology.

An inexpensive, yet accurate, precipitation gauge was developed from readily available materials. The gauge accurately estimated precipitation as measured by a standard Weather Bureau gauge for 35 precipitation events in a one-year period. This inexpensive gauge has been used successfully in the field for two years. (Sims-ISWS)  
W78-10523

### SUB-SERVICE SURVEYING.

Water and Waste Treatment, Vol. 21, No. 6, p 29, June, 1978.

**Descriptors:** \*Tracking techniques, \*Sewers, \*Drains, \*Electromagnetic waves, \*Remote sensing, Electronic equipment, Instrumentation, Marking techniques, Mapping, Analytical techniques, Pipes, Sewerage, Municipal wastes.

The electro-magnetic subsurface GPR 104 Drain Locator, manufactured by Electro-location Ltd., of Bristol, England, eliminates the need to excavate trial holes in locating the course of uncharted drains or sewers. A probe is rodged, jetted, or floated through the pipe; signals are transmitted by the probe to a hand-held surface receive equipped with earphones. The GRP 104 Drain Locator has reportedly saved the Cheltenham Borough in England the large expense of excavating the trial holes generally required to locate and map subsurface drains. (Lisk-FIRL)  
W78-10723

**EXTREME EVAPOTRANSPIRATION BY IRRIGATED ALFALFA: A CONSEQUENCE OF THE 1976 MIDWESTERN DROUGHT,**  
Nebraska Univ., Lincoln. Agricultural Meteorology Section.  
For primary bibliographic entry see Field 2D.  
W78-10923

**PROBABLE MAXIMUM PRECIPITATION ESTIMATES, COLORADO RIVER AND GREAT BASIN DRAINAGES,**  
National Weather Service, Silver Spring, MD. Office of Hydrology.  
For primary bibliographic entry see Field 2B.  
W78-10925

**WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS.**  
National Sanitation Foundation, Ann Arbor, MI.  
For primary bibliographic entry see Field 5A.  
W78-10927

**RADIATIVE TRANSFER MODEL FOR REMOTE SENSING OF SUSPENDED SEDIMENTS IN WATER,**  
MITRE Corp., McLean, VA. METREK Div.  
For primary bibliographic entry see Field 2J.  
W78-10930

**EXTRACTION AND INJECTION OF SOIL WATER WITH HOLLOW-FIBER SEMIPERMEABLE MEMBRANES,**  
Oak Ridge National Lab., TN.  
For primary bibliographic entry see Field 2G.  
W78-10939

**A PORTABLE CHAMBER FOR RAPID EVAPOTRANSPIRATION MEASUREMENTS ON FIELD PLOTS,**  
South Carolina Agricultural Experiment Station, Florence.  
For primary bibliographic entry see Field 2D.  
W78-11028

**ESTIMATING FIELD EROSION LOSSES FROM FALLOUT CESIUM-137 MEASUREMENTS,**  
Agricultural Research Service, Oxford, MS. Sedimentation Lab.  
For primary bibliographic entry see Field 2J.  
W78-11116

### 7C. Evaluation, Processing and Publication

**CHARACTERIZATION OF YIELD AND ECONOMIC LOSS FROM NONUNIFORM FERTILIZER DISTRIBUTION USING COMPUTER SIMULATION,**  
Nebraska Agricultural Experiment Station, Lincoln.  
For primary bibliographic entry see Field 3F.  
W78-10595

**GROUND-WATER RESOURCES OF TANGIPAHOA AND ST. TAMMANY PARISHES, SOUTHEASTERN LOUISIANA,**  
Geological Survey, Baton Rouge, LA. Water Resources Div.  
For primary bibliographic entry see Field 4B.  
W78-10620

**SURFACE WATER RECORDS OF COOK INLET BASIN, ALASKA, THROUGH SEPTEMBER 1975,**  
Geological Survey, Anchorage, AL. Water Resources Div.  
D. R. Scully, L. S. Leveen, and R. S. George.  
Open-file report 78-498 (basic data), 1978. 102 p, 2 fig.

**Descriptors:** \*Hydrologic data, \*Surface waters, \*Streamflow, \*Discharge (Water), \*Water temperature, Seepage, Streams, Gaging station, Flow rates, Water yield, Lakes, Basic data collections, Alaska, \*Cook Inlet Basin (Alas).

This report summarizes records of streamflow and water temperature collected prior to October 1, 1975, in the Cook Inlet Basin of south-central Alaska. Streamflow records for gaging stations are tabulated as monthly and annual summaries and annual extremes. For those gaging stations at which continuous or daily water temperature records have been collected, monthly summaries of water temperature extremes are shown. For other gaging stations periodic water temperatures are published. Discharge at crest-stage partial-record stations and at miscellaneous sites is tabulated. Results of seepage investigations are presented for 4 streams. (Woodard-USGS)  
W78-10621

**A GROUND-WATER INVENTORY OF THE WAIALUA BASAL-WATER BODY, ISLAND OF OAHU, HAWAII,**  
Geological Survey, Lakewood, CO. Water Resources Div.  
For primary bibliographic entry see Field 4B.  
W78-10622

**LOW-FLOW FREQUENCY OF GEORGIA STREAMS,**  
Geological Survey, Doraville, GA. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-10623

**WATER-RESOURCES SETTING, MARTIN COUNTY, FLORIDA,**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
R. A. Miller.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 064. Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 77-68, February 1978. 37 p, 20 fig, 1 tab, 7 ref.

**Descriptors:** Water resources, \*Surface waters, \*Groundwater, \*Hydrologic cycle, \*Hydrogeology, Maps, Aquifers, Water table, Water levels, Saline water intrusion, Water utilization.

tion, Drainage systems, Rainfall, Evaporation, Topography, \*Florida, Martin County(Fla), Physiographic subdivisions.

This report describes some basic principles of hydrology as they apply to Martin County, Florida. The major land features are described first, then the hydrologic cycle and surface-water and ground-water resource. Specific problems associated with population growth and the county's development, such as saltwater intrusion and water use, are cited and sections have been included to deal with these problems. The report is intended to provide a background on the water resource of Martin County to those who do not have the time nor the need to delve deeply into the county's hydrologic conditions or its water-management problems. It is freely illustrated and uses a minimum of text to explain the illustrations. General data on the water resources of the county are given, but few specific basic data are presented. (Woodard-USGS)  
W78-10626

#### WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1976.

Geological Survey, Raleigh, NC. Water Resources Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 316. Price codes: A18 in paper copy, A01 in microfiche. Water-Data Report NC-76-1, March 1977. 411 p, 4 fig.

Descriptors: \*North Carolina, \*Hydrologic data, \*Surface waters, \*Groundwater, \*Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1976 water year for North Carolina consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 146 gaging stations, stage and contents for 24 lakes and reservoirs, water quality for 20 gaging stations, and water levels for 54 observation wells. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements in this report. The collection of water-resources data in North Carolina is a part of the National Water-Data System operated by the U.S. Geological Survey in cooperation with State, municipal, and Federal agencies. (Woodard-USGS)  
W78-10627

#### WATER RESOURCES DATA FOR MARYLAND AND DELAWARE, WATER YEAR 1977.

Geological Survey, Towson, MD. Water Resources Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-283 561. Price codes: A15 in paper copy, A01 in microfiche. Water-Data Report MD-DE-77-1, May 1978. 319, 4 fig.

Descriptors: \*Maryland, \*Delaware, \*Hydrologic data, \*Surface waters, \*Groundwater, Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Maryland and Delaware consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report contains discharge records for 107 gaging stations, stage and contents for 1 reservoir, water quality for 53 gaging stations and 37 wells, and water levels for 29 observation

wells. Also included are data for 87 low-flow partial-record stations, 19 crest-stage partial-record stations, and 4 tidal crest-stage partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Maryland and Delaware. (Woodard-USGS)  
W78-10628

#### WATER RESOURCES DATA FOR NEVADA, WATER YEAR 1977.

Geological Survey, Carson City, NE. Water Resources Div.

Water-Data Report NV-77-1, April 1978. 334 p, 9 fig.

Descriptors: \*Nevada, \*Hydrologic data, \*Surface waters, \*Groundwater, \*Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Nevada consist of records of discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 120 gaging stations; stage and contents for 20 lakes and reservoirs; water-quality data for continuing-record stations at 27 stream sites and for partial-record stations at 8 stream sites, 2 lake sites, and 15 wells; and water level for 165 observation wells. Also included are 106 crest-stage partial-record stations and 13 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Nevada. (Woodard-USGS)  
W78-10629

#### GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1971-75.

Geological Survey, Lawrence, KA. Water Resources Div.

M. E. Broeker, H. J. McIntyre, Jr., and J. M. McNellis.  
Kansas Geological Survey, Lawrence Basic Data Series Ground-Water Release No 6, 1977. 526 p, 12 fig, 3 tab, 23 ref.

Descriptors: \*Water wells, \*Groundwater, \*Water levels, \*Water levels fluctuations, \*Kansas, Well data, Basic data collections.

This report contains the results of water-level measurements made in about 1,700 selected wells in 83 counties in Kansas during 1971-75. The report is the twelfth in a series of water-level reports published by the Kansas Geological Survey. The results of the measurements indicate that water levels in most of Kansas responded primarily to normal seasonal fluctuations in recharge and discharge during 1971-75. (Woodard-USGS)  
W78-10630

#### RAINFALL-RUNOFF DATA FOR SELECTED BASINS, PORTLAND, OREGON, AND VANCOUVER, WASHINGTON, 1973-77.

Geological Survey, Portland, OR. Water Resources Div.

A. Laenen, and G. L. Solin.  
Open-file report 78-291, 1978. 48 p, 2 fig, 4 tab, 4 ref.

Descriptors: \*Rainfall-runoff relationships, \*Small watersheds, \*Streamflow, \*Oregon, \*Washington, Gaging stations, Flow rates, Storm

runoff, Hydrologic data, Drainage area, Land use, Portland-Vancouver area, Basin characteristics.

In the Portland-Vancouver area, storms and floods are presently being studied in 16 basins with drainage areas ranging from 0.21 to 6.63 square miles and with various basin slopes, degrees of imperviousness, and mixes of land use. Fanno Creek basin in Portland has the longest period of rainfall-runoff record, starting in 1973; Tryon Creek basin in Portland is next with a record starting in 1974. Records in all other basins began in 1975. For each basin, data are tabulated for daily precipitation on a yearly basis and for 5-minute precipitation and 5-minute streamflow for selected storms. (Woodard-USGS)  
W78-10631

#### HYDROLOGIC RECONNAISSANCE OF THE YAMPA RIVER DURING LOW FLOW, DINOSAUR NATIONAL MONUMENT, NORTHWESTERN COLORADO.

Geological Survey, Lakewood, CO. Water Resources Div.

T. D. Steele, D. A. Wentz, and J. W. Warner.  
Available from OFSS, USGS, Box 25425, Fed. Ctr. Denver, Colo. 80225; paper copy, \$1.75; microfiche, \$3.50.

Descriptors: \*Hydrologic data, \*Streamflow, \*Water quality, \*Low flow, \*Trace elements, Bottom sediments, Data collections, Sampling, Water chemistry, Colorado, \*Yampa River, \*Dinosaur National Monument.

A hydrologic reconnaissance of a 74-kilometer reach of the Yampa River in Dinosaur National Monument in Colorado was made during the low flow in mid-August 1976. Stream discharge, which was measured every 16 to 24 kilometers, ranged from 9.4 to 10.6 cubic meters per second. Variations in streamflow were explained, in part, by underflow, loss to ground water, and evaporation. Specific conductance was measured about every 2 kilometers and indicated a downstream increase on the order of 11 to 12 percent for the reach. Except for mercury, bottom-sediment trace-element concentrations in the study reach were less than maximum concentrations determined during August-September 1976 for bottom sediments at unperturbed sites upstream in the Yampa River basin. At one of five sampling sites, the mercury concentration in bottom sediments exceeded the maximum measured upstream level. (Woodard-USGS)  
W78-10632

#### SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--HAWAII REGION.

Geological Survey, Honolulu, HI. Water Resources Div.

For primary bibliographic entry see Field 4B.  
W78-10635

#### SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--TENNESSEE REGION.

Geological Survey, Nashville, TN. Water Resources Div.

For primary bibliographic entry see Field 4B.  
W78-10637

#### SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCES--GREAT LAKES REGION.

Geological Survey, Indianapolis, MO. Water Resources Div.

For primary bibliographic entry see Field 4B.  
W78-10638



## Field 7—RESOURCES DATA

### Group 7C—Evaluation, Processing and Publication

**HYDROLOGIC RECONNAISSANCE OF THE DUGWAY VALLEY-GOVERNMENT CREEK AREA, WEST-CENTRAL UTAH.** Geological Survey, Salt Lake City, UT. Water Resources Div.

J. C. Stephens, and C. T. Sumsion.  
Utah Department of Natural Resources, Salt Lake City, Div of Water Rights, Technical Publication No 59, 1978, 42 p, 3 fig, 1 plate, 9 tab, 18 ref.

**Descriptors:** \*Water sources, \*Ephemeral streams, \*Groundwater resources, \*Water quality, \*Hydrologic data, \*Snowmelt, \*Precipitation (Atmospheric), \*Aquifer characteristics, \*Water wells, \*Water yield, \*Groundwater recharge, \*Water analysis, \*Utah, \*Dugway Valley-Government Creek area, \*Western Utah desert basins.

The Dugway Valley-Government Creek area covers about 890 square miles in west-central Utah. Total annual precipitation on the area averages about 380,000 acre-feet. Most streams are ephemeral except for a few in their upper reaches—all are ephemeral below the altitude of about 6,000 feet. Ground-water recharge from precipitation is about 7,000 acre-feet annually. Recharge is from snowmelt and thunderstorms and occurs principally in coarse alluvium of higher valleys and lower mountain slopes above 6,000 feet. About 5,000 acre-feet of ground water enters the area annually from the Sevier Desert by way of the Old River Bed. Total estimates recharge is thus about 12,000 acre-feet annually. Ground water moves generally northwestward to the Great Salt Lake Desert. Streamflow in the upper Government Creek area generally contains less than 500 milligrams per liter of dissolved solids and is calcium bicarbonate type water. Whereas wells along the eastern base of the Dugway Range discharge water containing more than 5,000 milligrams per liter of dissolved solids in which sodium and chloride are the predominant ions. Most of the water in the area is satisfactory for livestock and, except for that in western and northern Dugway Valley, the water is generally satisfactory for irrigation. (Woodard-USGS)  
W78-10644

**PROBABLE YIELDS OF WELLS IN THE SAND-AND-GRAVEL AQUIFER, WISCONSIN.** Geological Survey, Madison, WI. Water Resources Div.

R. W. Devaul.  
Wisconsin Geological and Natural History Survey map, 1975. 1 sheet.

**Descriptors:** \*Wisconsin, \*Aquifers, \*Maps, \*Water yield, \*Groundwater resources, \*Groundwater potential, \*Groundwater availability, \*Sand-and-gravel aquifer (Wis).

A map, at a scale of 1:100,000, shows the probable yields of wells in the sand and gravel aquifer, Wisconsin. The sand-and-gravel aquifer includes all saturated permeable glacial material and some recent alluvium overlying Wisconsin's bedrock. It underlies more than three-fourths of Wisconsin and is essentially the only source of ground water in the north-central one-third of the State. The aquifer occurs at the land surface or buried beneath less permeable materials. It is commonly less than 100 feet thick but is locally thicker than 300 feet. About one-fourth of Wisconsin's municipalities obtain their water supply from this aquifer. Well yields, in gallons per minute, are generally delineated by four probability ranges—areas where chances of more than 100 gallons per minute are poor to areas where chances of more than 1,000 gallons per minute are good. Yields depend on the thickness of the aquifer penetrated as well as the lithology of the rocks. (Woodard-USGS)  
W78-10646

**PROBABLE YIELDS OF WELLS IN THE SANDSTONE AQUIFER, WISCONSIN.** Geological Survey, Madison, WI. Water Resources Div.

R. W. Devaul.  
Wisconsin Geological and Natural History Survey map, 1975. 1 sheet.

**Descriptors:** \*Wisconsin, \*Aquifers, \*Sandstones, \*Water yield, \*Groundwater resources, \*Groundwater potential, \*Maps, \*Groundwater availability, \*Sandstone aquifer (Wis).

A map, at a scale of 1:100,000, shows the probable yields of wells in the sandstone aquifer, Wisconsin. The sandstone aquifer consists of a series of water-bearing sandstone and dolomite formations totaling several hundred feet in thickness over most of their extent. These rocks are more than 1,500 feet thick in extreme southeastern Wisconsin. Well yields, in gallons per minute, are really delineated by four probability ranges—areas where chances of more than 100 gallons per minute are poor to areas where chances of more than 1,000 gallons per minute are good. Yields depend on the thickness of the aquifer penetrated as well as the lithology of the rocks. (Woodard-USGS)  
W78-10647

**A PROGRESS REPORT ON ESTUARY MODELING BY THE FINITE-ELEMENT METHOD.** Geological Survey, Reston, VA. Water Resources Div.

For primary bibliographic entry see Field 2L.  
W78-10648

**INFORMATION EXCHANGE ON COMPUTER PROGRAMS (EXCHANGE D'INFORMATION DES PROGRAMMES D'ORDINATEURS).** International Inst. for Hydraulic and Environmental Engineering, Del Delft (Netherlands); and Waterloopkundig Lab., Delft (Netherlands). Edition 1, International Association for Hydraulic Research, Delft, Netherlands, January 1977. 81 p.

**Descriptors:** \*Computer programs, \*Hydraulics, \*Water resources, \*Catalogues, \*Keywords, \*Program index.

During several of the last International Association for Hydraulic Research (I.A.H.R.) Congresses, the need to create a facility for information exchange on existing computer programs in the field covered by the I.A.H.R. was expressed. As a result, the Technical Section on the Use of Computers in Hydraulics and Water Resources of the I.A.H.R. started a pilot project. A preliminary report of this activity was published in July 1975. Discussions at the XVIth Congress in Sao Paulo lead to a final form for the questionnaire as shown at the end of this report. At the time of preparation of the report, 161 different contributions had been received, but a considerable extension is foreseen in the coming years, and an annual updating will be made. Presented herein is a catalogue of existing computer programs in the fields of hydraulics and water resources. The information is provided in both French and English. Prospective contributors are requested to use the form at the end of this report or the forms attached to forthcoming journals of the Association. (Bell-Cornell)  
W78-10664

**WSP2 COMPUTER PROGRAM. A WATER SURFACE PROFILE FLOOD EVALUATIONS AND FLOOD AREAS FOR CERTAIN LOW RATES. USER'S GUIDE.** Soil Conservation Service, Washington, DC. Engineering Div.  
Available from the National Technical Information Service Springfield, VA 22161, as PB-260 751, price codes: A04 in paper copy, A01 in microfiche. Technical Release No. 61, May, 1976. 61 p, 1 fig.

**Descriptors:** \*Computer programs, \*Water flow, \*Bridges, \*Methodology, \*Data collections, \*Flooding, \*Evaluation, \*Analytical techniques, \*Water surface profile, \*Water-bridge interaction.

The WSP2 (Water Surface Profile 2) computer program can aid in the determination of flow characteristics for a given set of stream and flood-plain conditions. Specifically, it can compute water surface profiles in open channels, and it can estimate head losses at restrictive sections, including roadways with either a bridge opening or culverts. WSP2 is written in Fortran IV language and was developed on an IBM 360/65 computer. Three subprograms (HROFDA, DATE, and REREAD) were written in assembly language. The program requires about 220 kilobytes of core storage and three temporary data files. Specific information about the data files is on comment cards at the beginning of the program listing. Because the computations require a large amount of physical data on valley shape, roughness, flow restriction, etc., an attempt was made to make data entry as easy and flexible as possible. Punched output cards provide direct input to SCS flood routing and economic analysis computer programs. (Bell-Cornell)  
W78-10669

**FEASIBILITY STUDY FOR DEVELOPMENT AND IMPLEMENTATION OF A MODEL STATE INFORMATION SYSTEM (M.S.I.S.) FOR EPA'S SAFE DRINKING WATER PROGRAM.**

American Management Systems, Inc. Arlington, VA.  
For primary bibliographic entry see Field 5G.  
W78-10762

**INTRODUCTION TO THE MODEL STATE INFORMATION SYSTEM (MSIS).**

American Management Systems, Inc., Arlington, VA.  
For primary bibliographic entry see Field 5G.  
W78-10810

**MODEL STATE INFORMATION SYSTEM FOR THE SAFE DRINKING WATER PROGRAM, VOLUME II: EXHIBITS.**

American Management Systems, Inc., Arlington, VA.  
For primary bibliographic entry see Field 5G.  
W78-10811

**THE RELIEF AND LAND FORM MAP OF AUSTRALIA: DOES IT SHOW ROCK TYPES AND LAND FORMS OF HYDROLOGIC SIGNIFICANCE.** Monash Univ., Clayton (Australia). Dept. of Civil Engineering.  
T. A. McMahon.  
Catena, Vol. 4, No. 1/2, June 1977, p. 189-199, 4 tab, 3 fig, 6 ref.

**Descriptors:** \*Topographic mapping, \*Hydrography, \*Geologic mapping, \*Petrology, \*Geomorphology, \*Terrain analysis, \*Profiles, \*Surveys, \*Rocks, \*Correlation analysis, \*Hydrologic aspects, \*Low flow, \*Australia.

An examination was made of the usefulness of the relief and land form map of Australia from a hydrologic point of view. The map, published in 1969, is to scale of 1:5,000,000 and shows relief, land form, and rock types which were thought to be of general hydrologic significance. Prepared by the Australian Water Resources Council advisory panel on representative basins, this map was used to ascertain areas with similar morpholithology for the purpose of selecting Australian representative basins. 156 Australian catchments were studied and correlation and contingency analysis and analysis of variance were performed to determine the Map's general usefulness in defining hydrologic characteristics. Low flow hydrologic characteristics were related to rainfall, relief, land form

and lithology as described by the map. Results indicated that the land form map of Australia is a useful tool in differentiating qualitatively low flow characteristics and that it does show rock types and land forms of hydrologic significance. (Tikes-Arizona).  
W78-10963

**PREDICTION OF MINERAL QUALITY OF IRRIGATION RETURN FLOW: VOLUME IV. DATA ANALYSIS UTILITY PROGRAMS.**  
Bureau of Reclamation, Denver, CO. Engineering and Research Center.  
For primary bibliographic entry see Field 5G.  
W78-11091

**RECONNAISSANCE MEASUREMENTS AND SEDIMENT YIELD ESTIMATES IN BASINS WITH INSUFFICIENT DATA.**  
Technical Univ. of Prague (Czechoslovakia).  
For primary bibliographic entry see Field 2J.  
W78-11114

**A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, VOLUME 8.**  
Office of Water Research and Technology, Washington, DC.  
For primary bibliographic entry see Field 6A.  
W78-11207

**A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME V, TURBULENT ENERGY PROGRAM.**  
Rand Corp., Santa Monica, CA.  
For primary bibliographic entry see Field 2L.  
W78-11210

**AQUACULTURE TECHNIQUES: WATER USE AND DISCHARGE QUALITY.**  
Idaho Univ., Moscow. Coll. of Fisheries, Wildlife and Range Sciences.  
For primary bibliographic entry see Field 5G.  
W78-11219

**MARINE PASTURES: A BY-PRODUCT OF LARGE (100 MEGAWATT OR LARGER) FLOATING OCEAN THERMAL POWER PLANTS.**  
Lamont-Doherty Geological Observatory, Palisades, NY.  
For primary bibliographic entry see Field 5G.  
W78-11228

**A WATER-QUALITY SIMULATION MODEL FOR WELL MIXED ESTUARIES AND COASTAL SEAS: VOLUME IX, THE COMPUTER PROGRAM.**  
Rand Corp., Santa Monica, CA.  
For primary bibliographic entry see Field 5B.  
W78-11231

**THE DEVELOPMENT OF AN INTEGRATED SYSTEM FOR WATER QUALITY MANAGEMENT PLANNING.**  
Connecticut Univ., Storrs.  
For primary bibliographic entry see Field 5G.  
W78-11242

**WATER RESOURCES DATA FOR OREGON, WATER YEAR 1977.**  
Geological Survey, Portland, OR. Water Resources Div.  
Water-Data Report OR-77-1, June 1978. 607 p, 5 fig, 1 tab.

Descriptors: \*Oregon, \*Hydrologic data, \*Surface waters, \*Groundwater, \*Water quality, Gaging stations, Streamflow, Flow rates, Sediment trans-

port, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Oregon consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 283 gaging stations, stage only records for 10 gaging stations, stage and contents for 45 lakes and reservoirs, water quality for 79 gaging stations, and water levels for 97 observation wells. Also included are 157 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Oregon. (Woodard-USGS)  
W78-11252

**WATER RESOURCES DATA FOR MASSACHUSETTS AND RHODE ISLAND, WATER YEAR 1977.**  
Geological Survey, Boston, MA. Water Resources Div.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 977. Price codes: A14 in paper copy, A01 in microfiche. Water-Data Report MA-R1-77-1, May 1978. 304 p, 5 fig, 1 tab.

Descriptors: \*Massachusetts, \*Rhode Island, \*Hydrologic data, \*Surface waters, \*Groundwater, \*Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Massachusetts and Rhode Island consist of records of stage, discharge, and water quality of streams; contents of lakes and reservoirs; and ground-water levels. This report contains discharge records for 109 gaging stations, monthend contents for 15 lakes and reservoirs, water quality for 23 gaging stations, and water levels for 110 observation wells. Also included are data for 22 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements. A few pertinent stations (not included above) in bordering States are also included in this report. These data represent that portion of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Massachusetts and Rhode Island. (Woodard-USGS)  
W78-11253

**WATER RESOURCES DATA FOR NORTH CAROLINA, WATER YEAR 1977.**  
Geological Survey, Raleigh, NC. Water Resources Div.  
Available from the National Technical Information Service, Springfield, VA 22161 as PB-284 883. Price codes: A18 in paper copy, A01 in microfiche. Water-Data Report NC-77-1, May 1978. 395 p, 4 fig.

Descriptors: \*North Carolina, \*Hydrologic data, \*Surface waters, \*Groundwater, \*Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for North Carolina consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground-water

levels. This report contains discharge records for 149 gaging stations, stage and contents for 24 lakes and reservoirs, water quality for 146 gaging stations, and water levels for 55 observation wells. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements in this report. The collection of water-resources data in North Carolina is a part of the National Water-Data System operated by the U.S. Geological Survey in cooperation with State, municipal, and Federal agencies. (Woodard-USGS)  
W78-11254

**URBAN STORMWATER RUNOFF DATA FOR A RESIDENTIAL AREA, POMPANO BEACH, FLORIDA.**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
H. C. Mattraw, Jr., J. Hardee, and R. A. Miller.  
Open-file report 78-324, 1978. 108 p, 2 fig, 4 tab, 5 ref.

Descriptors: \*Storm runoff, \*Rainfall-runoff relationships, \*Water quality, \*Urban hydrology, \*Hydrologic data, Rainfall, Chemical analysis, Runoff, Rain water, Florida, \*Pompano Beach area, \*Broward County.

Rainfall, storm-sewer discharge, and water-quality analyses of storm runoff are summarized for a single-family residential area near Pompano Beach, Florida. The area of the drainage basin is 41 acres of which 61 percent is pervious sod lawns and 39 percent is impervious roofs, driveways and streets. The land surface is nearly flat with a gentle, eastward slope. Storm runoff flows eastward along grass swales into a sewer collection system on the eastern boundary of the area that in turn joins a 36-inch diameter storm drain. Runoff loads of 12 or more water-quality constituents were computed for 32 storms between April 1974 and September 1975. Chemical analyses of rainfall for 3 storms are included. (Woodard-USGS)  
W78-11258

**MONITORING WATER-QUALITY DURING PILOT DREDGING IN THE WILLAMETTE AND COLUMBIA RIVERS, OREGON.**  
Geological Survey, Portland, OR. Water Resources Div.  
For primary bibliographic entry see Field 5A.  
W78-11261

**FEDERAL PLAN FOR THE ACQUISITION OF WATER DATA—FISCAL YEARS 1978 AND 1979.**  
Geological Survey, Reston, VA. Water Resources Div.  
Office of Water Data Coordination Report, May 1978. 30 p, 2 fig, 10 tab, 5 append.

Descriptors: \*Programs, \*Federal government, \*Water resources, \*Projects, \*United States, Data collections, Hydrologic data, Regional analysis, Data storage and retrieval, \*U.S. Geological Survey, Environmental Protection Agency, \*National Water Data Network.

This report summarizes the Federal agencies' plans and needs for water data and gives the status of implementation of the Geological Survey's National Water Data Network, the Environmental Protection Agency's National Water Quality Surveillance System, and other coordination-related activities for fiscal years 1978 and 1979. The report generally follows the same format as that of the report for fiscal year 1977, with all sections updated. However, several activities are reviewed in the Federal Plan for the first time. These include the National Hydrologic Bench-Mark Network, listing all currently active stations and parameters covered, and the National Water-Use Data System. Current and planned program activities in the field of water-data acquisition are summarized

## Field 7—RESOURCES DATA

### Group 7C—Evaluation, Processing and Publication

for each participating agency through fiscal year 1979. (Woodard-USGS)  
W78-11267

**GEOHYDROLOGY OF THE GREAT BEND PRAIRIE, SOUTH-CENTRAL KANSAS,**  
Geological Survey, Lawrence, KA. Water Resources Div.  
S. W. Fader, and L. E. Stullken.  
Kansas Geological Survey, Lawrence, Irrigation Series No 4, May 1978. 19 p, 7 fig, 5 plates, 1 tab, 36 ref.

Descriptors: \*Groundwater resources, \*Hydrogeology, \*Aquifer characteristics, \*Water utilization, Irrigation, Water quality, Water wells, Water yield, Water levels, Potentiometric level, Withdrawal, Industrial water, Municipal water, Groundwater recharge, Maps, Hydrologic data, Kansas, \*Great Bend Prairie.

Unconsolidated deposits of Pliocene and Pleistocene age comprise the principal aquifer in the Great Bend Prairie, Kans. Forty-five million acre-feet of ground water are estimated to be in storage in these deposits. Only about 60 percent of this amount may be usable owing to an insufficient saturated thickness and to high mineralization of water locally. Yields to irrigation wells are commonly between 500 and 1,000 gallons per minute, and yields of as much as 2,000 gallons per minute may be available in localities where the saturated thickness is greater than 100 feet. In 1940, there were about 30 municipal and industrial wells and 50 irrigation wells in the area. In 1973, there were about 200 municipal and industrial wells and 950 irrigation wells; and in 1974, The steadily increasing withdrawal rate has not produced long-term declines of water levels that may be distinguished from the effects of climatic changes. The average annual recharge rate to ground water from precipitation is estimated to be about 2 inches. (Woodard-USGS)  
W78-11268

**FLOOD INVESTIGATIONS IN NEVADA THROUGH 1977 WATER YEAR, PROGRESS REPORT 17,**  
Geological Survey, Carson City, NV. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-11269

**WATER TABLE IN THE SURFICIAL AQUIFER AND POTENTIOMETRIC SURFACE OF THE FLORIDAN AQUIFER IN SELECTED WELL FIELDS, WEST-CENTRAL FLORIDA, SEPTEMBER 1977.**  
Geological Survey, Tallahassee, FL. Water Resources Div.  
P. D. Ryder, and L. R. Mills.  
Open-file report 78-311, April 1978. 13 p, 2 fig, 4 plates, 1 tab, 2 ref.

Descriptors: \*Maps, \*Aquifer characteristics, \*Groundwater, \*Water table, \*Potentiometric level, Water wells, Withdrawal, Seasonal, Effects, Water levels, Florida, \*Tampa Bay area, Floridan aquifer, Surficial aquifer.

The water table in the surficial aquifer and the potentiometric surface of the Floridan aquifer in a 1,200 square-mile area in west-central Florida are mapped semiannually by the U.S. Geological Survey. Maps are prepared on the basis of water levels measured in wells each May to coincide with seasonal low levels; and in September, when levels are high. The mapped area for this report contains nine producing wells fields which supplied 76.2 million gallons on September 21, 1977, to municipalities in the Tampa Bay area. The effect of localized withdrawal of groundwater from the Floridan aquifer is shown on the maps as cones of depression in both the potentiometric surface and water table. In September, water levels in ob-

servation wells in the Floridan aquifer were above those measured in May. These increases ranged from about 1 foot at the Eldridge-Wilde well field to about 25 feet at the Sun City well field. (Woodard-USGS)  
W78-11270

**DISCHARGE, GAGE HEIGHT, AND ELEVATION OF 100-YEAR FLOODS IN THE HUDSON RIVER BASIN,**  
Geological Survey, Albany, NY. Water Resources Div.  
For primary bibliographic entry see Field 2E.  
W78-11271

**WATER-LEVEL RECORDS FOR THE NORTHERN HIGH PLAINS OF COLORADO, 1974-78,**  
Geological Survey, Lakewood, CO. Water Resources Div.  
R. G. Borman.

Available from the OFSS, USGS Box 25425, Fed. Ctr Denver, CO 30225; Paper copy, \$4.75; Microfiche, \$3.50. Open-file report 78-499, May 1978. 30 p, 2 fig, 1 tab.

Descriptors: \*Groundwater resources, \*Water wells, \*Water levels, \*Water level fluctuation, \*Aquifers, Colorado, \*Northern High Plains, Ogallala Formation.

Water-level measurements were made in more than 600 well in January 1978 in the northern High Plains of Colorado. Changes in water levels from January 1977 to January 1978 ranged from a rise of about 22 feet in Phillips County to a decline of about 14 feet in Yuma County. Measurements for January 1978 and the four preceding winters are given in a table. (Woodard-USGS)  
W78-11273

**JANUARY 1978 WATER LEVELS, AND DATA RELATED TO WATER-LEVEL CHANGES SINCE 1940 OR 1950, WESTERN KANSAS,**  
Geological Survey, Garden City, KS. Water Resources Div.  
M. E. Pabst.  
Open-file report 78-409, April 1978. 179 p, 4 tab.

Descriptors: \*Groundwater, \*Water levels, \*Observation wells, \*Kansas, \*Water level fluctuations, \*Irrigation, Seasonal, Groundwater recharge, Aquifers, Hydrogeology, \*Western Kansas.

Water-level measurements were made in about 1,450 observation wells in 34 counties as part of an annual inventory of ground-water conditions in western Kansas. The measurements were made in midwinter, mostly in January 1978, when pumping was minimal and water levels had recovered from the effects of pumping during the previous irrigation season. Tables show the depths to water in 1940 or 1950 (the predevelopment years), 1966 (a year of abnormally high rainfall), 1977, and 1978; water-level changes from 1940-78 or 1950-78 and from 1966-78, and from 1977-78; and average annual changes from 1940-78 or 1950-78 and from 1966-78. Also shown are saturated thicknesses of the deposits in 1940 or 1950 and in 1978 and the amount of change in feet and percentage. (Woodard-USGS)  
W78-11275

**GROUNDWATER DATA FOR THE SALT BASIN, EAGLE FLAT, RED LIGHT DRAW, GREEN RIVER VALLEY, AND PRESIDIO BOLSON IN WESTERNMOST TEXAS,**  
Geological Survey, Austin, TX. Water Resources Div.  
D. E. White, J. S. Gates, J. T. Smith, and B. J. Fry.  
Open-file report 77-575, March 1978. 120 p, 8 fig, 3 tab, 5 ref.

Descriptors: \*Groundwater resources, \*Water wells, \*Springs, \*Water quality, \*Aquifers, Well data, Water levels, Water analysis, Chemical analysis, Water utilization, Irrigation, Industrial water, Municipal water, Water supply, Domestic water, Texas.

From October 1971 through October 1974, the U.S. Geological Survey collected groundwater data in the basins in Texas west of the Pecos River drainage area and northwest of the Big Bend country. The basins included are, from east to west: The Presidio Bolson; the Salt Basin; Green River Valley, Eagle Flat, and Red Light Draw. The data collection program consisted of an inventory of all major irrigation, municipal-supply, and industrial wells; selected stock and domestic wells; and selected springs. Water samples were collected from representative wells and springs for chemical analyses. (Woodard-USGS)  
W78-11276

## 8. ENGINEERING WORKS

### 8A. Structures

**SHORE EROSION CONTROL STRUCTURE,**  
Sandgrabber, Inc., Bay City, MI. (Assignee).  
S. S. Fair.

U.S. Patent No. 4,073,145, 7 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 967, No 2, p 421, February 14, 1978.

Descriptors: \*Patents, \*Shore protection, \*Beach erosion, Breakwaters, Coastal structures, Sea walls, Waves(Water).

A seawall structure adapted to combat erosion of a shoreline by wave action comprises a perforate wall arranged along and substantially parallel to the shoreline and having openings facing seaward through which the water of incoming waves may pass. Each opening through the wall forms a tortuous passage for the water so that the energy of the water is dissipated gradually as it flows through the wall, thereby enabling sand entrained in the water to be deposited landward and seaward of the wall, as well as in the openings of the wall. The wall is composed of blocks arranged in horizontal rows and vertical courses, the upper edges of the blocks in the outermost rows projecting above the upper edges of the blocks of the next adjacent rows to provide an interlocking relationship between blocks of the outermost rows and the blocks of the next adjacent rows, as well as to provide for vertical deviations in the openings through the wall. (Sinha-OEIS)  
W78-10704

**UNDERWATER TRUSSES FOR BREAKWATER STRUCTURE,**  
T. Ono.

United States Patent No. 4,074,497, 7 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 867, February 21, 1978.

Descriptors: \*Patents, \*Breakwaters, \*Waves(Water), Engineering structures, Barriers, Protection, \*Trusses, Underwater construction.

Underwater trusses of three-dimensional structure are adapted to be used as a breakwater or an underwater structure for protecting an underwater construction from impact of waves. Hollow web members are engaged at the ends with joint members which are provided with holes for holding the end of the web members. The hollow members are provided at an intermediate position with a flange extending perpendicularly to the members. A truss structure is constructed by use of the hollow web members and the joints. (Sinha-OEIS)  
W78-10713

**GUIDELINES FOR ENVIRONMENTAL PROJECTS**  
Curran Assoc.  
For primary entry see W78-10761

**COMPARISON OF RESULTS FROM ARCH DAMS**  
Army Engineer Research and Development Center, Vicksburg, MS.  
R. D. Crowe.  
Available from the National Technical Information Service, Springfield, VA 22161.  
060, Price MF01.  
Microfiche.  
53 p, 22 fig.

Descriptors: \*Vibrations, Onsite investigations, Concave, Mechanical

Vibration type and amplitude of arch dam in no. 1, shapes, dimensions. Two dam were series of tests a 40-lb out counterrotated a 5,000-lb whereas at locations curves were while the frequency ranged from These vibrations damping (Sims-LSV)  
W78-10933

### 8B. Hydraulics

**FINAL MODEL TESTS,**  
Naval Works Division.  
For primary entry see W78-10666

**A STUDY OF FLOW DESIGN**  
New South Wales Water Resources R. J. Cox.  
Report No. 153 ref.

Design Hydrology Aquifer Velocity Electromagnetic

Present groundwater methods technical well only in the numerical water level time well zone on the



**GUIDELINES FOR EPA REVIEW OF ENVIRONMENTAL IMPACT STATEMENTS ON PROJECTS INVOLVING IMPOUNDMENTS.**  
Curran Associates, Inc., Northampton, MA.  
For primary bibliographic entry see Field 6G.  
W78-10761

**COMPARISON OF VIBRATION TEST RESULTS FOR A MODEL AND PROTOTYPE ARCH DAM.**  
Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects Lab.  
R. D. Crowson, and C. D. Norman.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A038 060. Price codes: A04 in paper copy, A01 in microfiche. Technical Report N-77-1, March 1977. 53 p, 22 fig, 16 tab, 6 ref.

Descriptors: \*Dams, \*California, \*Arch dams, \*Vibrations, Laboratory tests, Model studies, Onsite investigations, Structures, Hydraulic structures, Concrete structures, Mechanical properties, Mechanical engineering, \*North Fork Dam (Calif).

Vibration tests were conducted on both the prototype and a 1:24-scale model of the North Fork Dam in northern California, a double curvature arch dam, to determine natural frequencies, model shapes, damping ratios, and hydrodynamic pressures. Two vibrators mounted on the crest of the dam were used as input excitation sources for both series of tests. Electromagnetic shakers capable of a 40-lb output were used in the model tests, while counterrotating, eccentric mass exciters capable of a 5,000-lb output were employed for the model, whereas accelerations were measured in the same locations on the prototype. Measurements in both curves were taken at the dam-reservoir interface while the structures were excited at resonant frequencies. Damping in both model and prototype ranged from approximately 2 to 5% of critical. These values were consistent with structural damping values for these types of structures. (Sims-ISWS)  
W78-10937

## 8B. Hydraulics

**FINAL REPORT, ENVIRONMENTAL IMPACT MODEL DEVELOPMENT FOR NAVAL OPERATIONS.**  
Naval Weapons Center, China Lake, CA. Public Works Dept.  
For primary bibliographic entry see Field 6G.  
W78-10667

**A STUDY OF NEAR WELL GROUNDWATER FLOW AND THE IMPLICATIONS IN WELL DESIGN.**  
New South Wales Univ., Kensington (Australia). Water Research Lab.  
R. J. Cox.  
Report No. 148, March 1977. 233 p, 132 fig, 22 tab, 153 ref, 3 append.

Descriptors: \*Groundwater, \*Water wells, \*Design, \*Finite element analysis, \*Flow, Hydrology, Analytical techniques, Optimization, Aquifers, Equations, Darcy flow, Nonlinear flow, Velocity, Hydraulic gradient, Analogue model, Electrolytic tank.

Presented are the results of an investigation of groundwater flow to wells. The finite element method was used to examine a wide range of practical well flow problems that have not been previously investigated in sufficient detail. Results of the numerical solutions provide practicing groundwater hydrologists with more complete information which may be used in the selection of an optimal well design. Since the flow within the near well zone exerts a disproportionately large effect on the performance of a well, considerable emphasis

is placed upon investigating factors which may significantly alter the flow behavior close to the well. The effects of nonlinear flow, aquifer inhomogeneity, well geometry and boundary conditions are examined in detail. Verification of the finite element solutions by comparison with known analytical solutions and experimental results from an electrolytic tank analogue and a large scale sand-box model is described. For the various well-aquifer systems investigated, the well performance results are presented in design tables and figures. Extensive use of general dimensionless groupings of the design variables simplifies the presentation of results. The application of the results in the optimization of well design is discussed. (Bell-Cornell)  
W78-10668

**WSP2 COMPUTER PROGRAM. A WATER SURFACE PROFILE COMPUTER PROGRAM FOR DETERMINING FLOOD EVALUATIONS AND FLOOD AREAS FOR CERTAIN LOW RATES.**  
USER'S GUIDE,  
Soil Conservation Service, Washington, DC. Engineering Div.  
For primary bibliographic entry see Field 7C.  
W78-10669

**CONVERGENCE OF FOUR-POINT IMPLICIT WATER WAVE MODELS.**  
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 2E.  
W78-10912

**VARIED FLOW FUNCTIONS FOR CIRCULAR CHANNELS.**  
Newcastle-upon-Tyne. (England). Dept. of Civil Engineering.  
C. Nalluri, and J. H. Tomlinson.  
Journal of Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings paper 13889, p 983-1000, July 1978. 2 fig, 4 tab, 11 ref.

Descriptors: \*Backwater, \*Channels, \*Flow, Conduits, Flow profiles, Gradually varied flow, Open channels, Pipes, Hydraulics, \*Backwater profiles, Backwater curves.

Hydraulic engineers often are required to compute backwater curves, and the existing methods cannot be applied accurately to closed conduits as the flow approaches the crown. This paper reviewed the Keifer and Chu method which uses the dimensionless parameter  $Q/Q_{CAP}$ . A new approach was developed to compute backwater curves in circular channels in which the factor  $Q/Q_{CAP}$  is removed so that errors are not introduced by having to interpolate these values. This new method is applicable for all possible bed slope conditions (horizontal, adverse), which is a distinct advantage over the other existing techniques. Semigraphical methods also were suggested to increase the speed of computation of backwater curves. (Lee-ISWS)  
W78-10913

**MATHEMATICAL SIMULATION OF DAM-BREAK FLOW.**  
Ljubljana Univ. (Yugoslavia). Dept. of Civil Engineering.  
R. Rajar.  
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13883, p 1011-1026, July 1978. 10 fig, 23 ref.

Descriptors: \*Dam failure, \*Mathematical models, \*Floods, Hydraulic models, Hydraulics, Open channel flow, Rivers, Unsteady flow, Waves (Water), Fluid mechanics, Equations, Non-prismatic channels, St. Venant equation.

A one-dimensional mathematical model for the simulation of this flow was described, especially the boundary conditions and the application of numerical schemes to highly nonprismatic channels. To analyze the applicability and the accuracy of the mathematical model, four physical models were used. The conclusions were: (1) in relatively nonprismatic rivers, the order of accuracy of the mathematical model described is 15% to 20%, and the model becomes unreliable in some extreme cases; (2) the main part of the error is due to the imperfection of the St. Venant equations used and only a smaller part to the inaccuracy of numerical methods; and (3) two explicit numerical schemes were investigated, the diffusive and the Lax-Wendroff scheme, the latter being more accurate. For the calculation of flow in highly nonprismatic channels, both schemes require completion of the St. Venant equations by a dissipative term in order to prevent instability and to achieve better simulation of the flow. (Lee-ISWS)  
W78-10914

**CALIBRATION TECHNIQUE FOR 1-D UNSTEADY FLOW MODELS.**  
National Weather Service, Silver Spring, MD. Hydrologic Research Lab.  
D. L. Fread, and G. F. Smith.  
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY7, Proceedings Paper 13892, p 1027-1044, July 1978. 10 fig, 2 tab, 19 ref.

Descriptors: \*Unsteady flow, \*Calibrations, \*Model studies, Channels, Fluid mechanics, Friction, Hydraulics, Mannings equation, Mathematical models, Open channel flow, Optimization, Rivers, Roughness (Hydraulic), Optimization techniques, \*Roughness-discharge relationship, Unsteady flow equation.

A simple and efficient optimization technique is presented for determining the continuous piecewise linear variation of the roughness parameter with discharge (or stage) for each reach of the river system bounded by gaging stations or major tributary confluences. The optimization technique was based on a modified Newton-Raphson gradient-type algorithm and the application of a decomposition principle that simplifies the treatment of complex river systems of dendritic (tree-type) configuration. The observed-computed stage hydrograph RMS errors coincident with the optimal roughness-discharge relationship range from essentially 0 for ideal systems with no observational errors from 0.2 ft to 0.7 ft (0.06 to 0.21 m) for complex natural systems. The required computation time (IBM 360-195) is about 0.005 sec per time step per distance step when the optimization technique is coupled with a weighted four-point implicit finite difference approximation of the unsteady flow equations. (Lee-ISWS)  
W78-10915

**TOTAL LOAD OF BED MATERIALS IN OPEN CHANNELS.**  
Tokyo Inst. of Tech. (Japan). Dept. of Civil Engineering.  
For primary bibliographic entry see Field 2J.  
W78-10916

**FLUID ROUTING BY CHARACTERISTIC METHODS.**  
Lanchester Polytechnic, Coventry (England). Dept. of Civil Engineering.  
For primary bibliographic entry see Field 2E.  
W78-10918

**WAVE SETUP ON A SLOPING BEACH.**  
Coastal Engineering Research Center, Fort Belvoir, VA.  
For primary bibliographic entry see Field 2L.  
W78-10929

## Field 8—ENGINEERING WORKS

### Group 8B—Hydraulics

#### FRICITION LOSSES IN CORRUGATED METAL PIPE.

Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A000 313, Price codes: A04 in paper copy, A01 in microfiche. Report No. 40-1, July 1955. 67 p, 29 fig, 10 tab, 6 ref.

Descriptors: \*Pipe flow, \*Flow friction, \*Fluid friction, Metal pipes, Roughness (Hydraulic), Reynolds number, Darcys law, Mannings equation, Paving, Pipes, Conduits, Hydraulic conduits, Hydraulics, Corrugated pipes.

The purpose of this study was to determine friction factors for 3-, 5-, and 7-ft-diam corrugated metal pipe, as indicated by head-loss measurements for a range of velocities up to approximately 10 fps for 5-, and 7-ft-diam pipe and 16 fps for 3-ft-diam pipe. Tests were conducted on new, straight, corrugated pipe of standard manufacture that was assembled in a manner similar to a conventional installation. Water from the forebay pool of Bonneville Dam was supplied to the test section through 6-ft smooth pipe. The results of the study indicated that a close correlation existed between Reynolds number and both Darcy's friction coefficient 'f' and Manning's roughness coefficient 'n' throughout the range of experimental discharges reproduced for study. The value of Manning's 'n' remained almost constant at 0.024 during observations of open-channel flow in unpaved corrugated metal pipe 3 and 5 ft in diam that were laid on a slope of 0.005. Values of 'n' for 5-ft-diam pipe having paved inverts varied with the per cent of paving and the depth of flowing water in test pipe laid on a slope of 0.002. (Sims-ISWS)  
W78-10934

#### STABILITY TESTS OF NAWILIWILI BREAK-WATER REPAIR.

Army Engineer Waterways Experiment Station, Vicksburg, MS.  
D. D. Davidson.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 620, Price codes: A03 in paper copy, A01 in microfiche. Miscellaneous Paper H-78-4, January 1978. 28 p, 4 pl, 11 photos, append.

Descriptors: \*Breakwaters, \*Hydraulic models, \*Hawaii, \*Dolosse, \*Nawiliwili Harbor (Hawaii), Rubble-mound breakwaters.

Undistorted-scale hydraulic model tests (1:30.5) were conducted to investigate the adequacy of dolos repair sections considered for use on the Nawiliwili breakwater, Island of Kauai, Hawaii. Test sections 1 and 1A were considered for repair to breakwater sta 15+00 to 20+00 and test sections 2 and 3 were considered for sta 2+00 to 15+00 and 5+00 to 12+00, respectively. Results of the tests indicated that all of the repair sections tested are of adequate stability for the test conditions and locations for which they were tested. (WES)  
W78-10948

#### REGIONAL GEOLOGY SERIES: PART VII.

National Water Well Association, Worthington, OH.

H. Heiss.  
Water Well Journal, Vol 32, No 9, p 57-58, August, 1978. 1 fig.

Descriptors: \*Groundwater, \*Mountains, \*Aquifers, \*Water wells, \*Drilling, Rotary drilling, Crystalline rocks, Rocky Mountain Region.

The Western Mountain Ranges Region is an area of rugged, high mountains composed of hard, dense and impermeable crystalline rocks. Fault zones in some areas may act as conduits or as barriers to ground water flow.

Alluvial aquifers in valleys provide much of the region's ground water. Wells penetrating the glacial outwash in the Spokane Valley can yield as much as 60 million gallons per day with moderate drawdown. Hard volcanic rocks produce most of the area's water. Basalts yield up to 110 gpm while andesites range from one to 20 gpm. Two types of wells are drilled in the Western Mountain Range: the rock well; and the alluvium well. Rock wells are drilled using air/mud rotary rigs with a downhole hammer. Development in hard rock consists of air surging or hydraulic fracturing. Alluvial wells are drilled using the mud rotary method. These wells are usually less than 100 feet deep and gravel packed. They must be carefully cased and grouted to seal off contaminated water. (Purdin-NWWA)  
W78-11071

#### GEOHERMAL DRILL BIT IMPROVEMENT-SPECIFIC APPLICATION TO THE GEYSERS.

Terra Tek, Inc., Salt Lake City, UT.  
For primary bibliographic entry see Field 8G.  
W78-11082

#### INHIBITOR CUTS PIPE LOSS IN GEOTHERMAL DRILLING.

Union Oil Co. of California, Brea.  
For primary bibliographic entry see Field 8G.  
W78-11084

#### THE SUBTERRANEAN ROCK MELTING CONCEPT APPLIED TO THE PRODUCTION OF DEEP GEOTHERMAL WELLS.

Los Alamos Scientific Lab., NM.  
For primary bibliographic entry see Field 8G.  
W78-11085

#### GUIDE TO DRILLING, WORKOVER AND COMPLETION FLUIDS, (1978-79).

Gulf Publishing Co., Houston, TX.  
For primary bibliographic entry see Field 8G.  
W78-11087

#### SEDIMENT PROBLEMS AT INTAKES FOR HYDROPOWER PLANTS.

Uttar Pradesh Irrigation Research Inst., Roorkee (India).  
H. D. Sharma, and H. R. Sharma.

In: Erosion and Solid Matter Transport in Inland Waters Symposium; Proceedings of the Paris Symposium, July 1977: International Association of Hydrological Sciences Publication No. 122, p 330-337, July 1977. 6 fig, 9 ref.

Descriptors: \*Intakes, \*Hydroelectric plants, \*Sediment control, \*Model studies, Diversion structures, Hydraulic structures, Rivers, Running waters, Sedimentation, Sediment transport, Hydraulic models, Analytical techniques, Trapping, Foreign research, Foreign countries, Desilting, \*India.

Unique solutions evolved to solve sediment problems at the intake structures of some major Himalayan run-of-river schemes were described. Considerations for fixing the layout of a power intake to minimize sediment entry were discussed. Different solutions of sediment problems at power intakes discussed are expected to help the designer in finding a suitable solution to his problem, depending upon the project constraints and the topographical features of the site. It was shown that efficient solutions can be solved to suit the site conditions and the project constraints with the help of model studies. In the absence of suitable topographical features, favorable flow curvature can be induced at the intake by providing an appropriate length of divide wall, if the diversion work is a barrage. (See also W78-11113) (Humphreys-ISWS)  
W78-11148

#### A CASE HISTORY OF PORT MANSFIELD CHANNEL, TEXAS.

Coastal Engineering Research Center, Fort Belvoir, VA.  
J. M. Kieslich.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A04 651, Price codes: A04 in paper copy, A01 in microfiche. General Investigation of Tidal Inlets (GITI) Program, Report No. CERC-GITI-12, May 1977. 10 fig, 7 tab, 5 append.

Descriptors: \*Sediment transport, \*Inlets (Waterways), \*Baseline studies, \*Hydraulics, Texas, Coasts, Resources development, Water quality, Outer Continental Shelf, Tidal inlets, Longshore transport, Ports.

A case history and analysis of Port Mansfield channel, an artificial, jettied inlet between the Gulf of Mexico and Laguna Madre, Texas is presented. Deposition has occurred in the channel entrance since its opening. Seaward migration of the updrift beach and shoaling in the channel entrance indicate that sand is bypassing the jettied entrance. Short-term predictions of inlet stability using the O'Brien prism-area relationship (Jarrett, 1976), Iscoffier's (1940) stability criteria, and the Brunn and Gerritsen (1960) ratio of tidal prism to the gross annual longshore transport rate, correctly predict the unstable nature of the channel. Tidal exchange volumes and velocities are not large enough to maintain the design cross-sectional area in the presence of the existing longshore transport. (Sinha-OEIS)  
W78-11235

#### LABORATORY INVESTIGATION OF TIDAL INLETS ON SANDY COASTS.

California Univ. Berkeley. Hydraulic Engineering Lab.

R. E. Mayor-Mora.  
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A04 021, Price codes: A06 in paper copy, A01 in microfiche. Army Coastal Engineering Research Center, General Investigation of Tidal Inlets (GITI) Program, Report No. CERC-GITI-11, April 1977. 105 p, 43 fig, 8 tab, 12 ref. DACW72-71-C-0005.

Descriptors: \*Inlets (Waterways), \*Coasts, \*Baseline studies, \*Water quality, Resources development, Hydraulics, Laboratory tests, Outer Continental Shelf, Tidal inlets.

Experiments were conducted on a fine sand barrier separating two 1 foot-deep basins representing an ocean and a 94- by 64-foot bay. Pilot channels with varying geometric characteristics were cut through the barrier to communicate the basins and thus create an ocean-inlet-bay system subsequently subjected to ocean tide and wave action. Measurements were made of cross-sectional areas, water surface elevations at ocean bay, and inlet current velocities for a number of cycles (sinusoidal tides) until the water surface fluctuations in the bay became periodic for each run. Exploratory studies included runs with jettied inlets, with freshwater inflow into the bay, inlets under mild and steep ocean waves, and to determine the effect of model bed ripple orientation on the friction coefficient of the inlet channel. Experimental data are presented in tabular and photographic form, and as plots correlating the various dimensionless hydraulic parameters (e.g., tidal range damping coefficient, bay super-elevation, mean current velocity timelag between maxima and minima, duration of ebbtide) to the repletion coefficient, K, and to a proposed parameter. These results are compared to the basic theoretical solution of the problem by Keulegan (1967) and to an extension of the Keulegan theory. Comparison of tidal prism and minimum flow areas are made between the laboratory results and available field data. An appendix includes plots summarizing the inlet channel's geometrical properties for the experiments. (Sinha - OEIS)

W78-11236

**SUPPLEMENTARY HYDRAULIC ANALYSIS OF PROPOSED BRIDGE SITE ON MOHAWK RIVER, WHITESBORO, NEW YORK.**  
Geological Survey, Albany, N.Y. Water Resources Div.

For primary bibliographic entry see Field 4C.  
W78-11272

## 8C. Hydraulic Machinery

### RUGGED SELF-PRIMING PUMPS.

Water Services, Vol. 82, No. 987, p 290, May, 1978.

Descriptors: \*Pumps, \*Hydraulic equipment, \*Sludge disposal, \*Storm water, \*Sealants, Protective coatings, Equipment, Design data, Solid wastes, Electric motors, Waste water treatment, Municipal wastes.

Gormann-Rupp 'T' series self-priming pumps, supplied by Wade Engineering Ltd. of Brighton, England, can upgrade existing or outmoded sewage treatment plants. The pumps can provide recirculation, storm flow balancing, and sludge removal without excessive structural modifications to the plant. The Gorman-Rupp seal protects the pump; when weather proofing and anti-frost heating elements are incorporated into the pump's design, no housing is required. Complete pumping units with motor and bedplate or bareshaft units, attachable to an electric motor, are available in 75, 100, 150, 200, and 250 mm sizes. The T4 series can accommodate 75 mm solids, 33.5 m heads, a discharge of up to 530 gal/min, and connection to suction lifts up to 7.6 m. (Lisk-FIRL)  
W78-10548

### NEW CONCEPT CLAIMED FOR SEWAGE AERATION.

For primary bibliographic entry see Field 5D.  
W78-10609

### MOTORISED VALVE SYSTEM FOR SLUDGE VESSEL.

For primary bibliographic entry see Field 5E.  
W78-10674

### DUAL PURPOSE VEHICLE.

For primary bibliographic entry see Field 5E.  
W78-10682

### SELF-CLEANING FIXED DREDGE.

T. L. Schoonmaker.  
U.S. Patent No. 4,074,535, 6 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 967, No 3, p 880, February 21, 1978.

Descriptors: \*Patents, \*Dredging, Channel improvement, Jets, Nozzles, Orifices, diffusion, Equipment, Dredges.

A stationary dredge is described in which a generally horizontal pipe is laid on the bottom of the waterway which is connected to the suction line of a pump. The horizontal line is provided with perforations into which sand and silt are drawn by the suction of the pump. Clear water is supplied to the horizontal line near the perforations closest to the connection to the pump to dilute the slurry passing through the perforated pipe and thereby reduce clogging. One disadvantage of this system is that when used in areas having high kelp growth or where a large amount of nongranular debris such as cans, bottles or water-logged driftwood have settled on the bottom, these non-granular debris are drawn by suction over the perforations, thereby clogging them. In this invention the orifices are cleared of debris by high velocity water

jets from a number of nozzles, each nozzle being directed across a separate one of the orifices of the horizontal pipe. Groups of selected nozzles at spaced intervals along the horizontal pipe are separately connected by pipes to a source of high pressure fluid. The high velocity jets of water mix with the bottom sand to degrade any solid matter which tends to block the orifices. (Sinha-OEIS)  
W78-10714

### DRAINAGE AND SEWAGE PUMPS.

Water and Waste Treatment, Vol. 21, No. 6, p 41, June, 1978.

Descriptors: \*Pumps, \*Sewage, \*Solid wastes, \*Drainage systems, \*Submergence, Equipment, Hydraulic machinery, Impellers, Linings, Rubber, Sumps, Equipment, Design data, Electric power, Waste water disposal, Waste water treatment, Municipal wastes.

Sweden's Pumpex A. B. drainage and sewer pumps will be distributed in England by Sykes Pumps Ltd. Pumpex manufactures six drainage pumps with output capacities of 70-840 gpm. Two models are equipped with torque flow impellers for solids handling and are available with rubber liners for abrasive solids loads or without liners for pumping sludges and non-abrasive slurries. Voltage ratings range over 240 or 110 volts for single phase to 415 or 550 volts for three phase. The drainage pumps with diameters down to 285 mm are suitable for narrow trenches and other restricted areas; all the drainage pumps can operate in series or in parallel configurations. Submersible sewage pumps are available as mobile units or stationary units attached to a wet sump or submerged in a wet pit. The modular pumps may be supplied with single channels or with torque flow impellers with solids capacities up to 125 mm. The 56 torque flow impeller equipped models have capacities up to 1,210 gpm; single channel pumps are available in 40 models with capacities up to 2,100 gpm. The wet pit submerged pump units may be raised for maintenance by disconnecting the volute positioned at the bottom of the sump. Sewage pumps have voltage ratings of either 415 volts in three phase or 240 volts single phase. (Lisk-FIRL)  
W78-10719

### JAPANESE GAS FROM SEWER SLUDGE.

For primary bibliographic entry see Field 5D.  
W78-10741

### CENTRIFUGAL SEWAGE PUMP.

Kabushiki Kaisha Sogo Pump Seisakusho, (Osaka) Japan. (Assignee)  
S. Tsukube.  
United States Patent 4,076,179. Issued February 28, 1978. Official Gazette of the United States Patent Office, Vol 967, No 4, p 1427, February, 1978. 1 fig.

Descriptors: \*Centrifugal pumps, \*Equipment, \*Patents, \*Impellers, \*Pumps, Design criteria, Separation techniques, Sewage, Waste water treatment, Municipal wastes.

A centrifugal sewage pump consisting of a semi-open impeller with a disk-like impeller shroud has been patented. The shroud has multiple impeller vanes and is mounted on a pump shaft. The front face of the impeller shroud contains depressions forming annular inner and outer edges. The outer edge of the shroud is covered with a shroud ring of a pump casing. Each impeller vane on the front face of the shroud disk extends out from the shroud and has a smooth front edge. An inner face casing, located in front of the impeller, surrounds a suction valve for removing solid wastes. The height of the impeller's outer periphery is 30-70% of the water passage clearance between the inner face casings. Two portions of the shroud front face are located in symmetrical positions without backward depressions. (Lisk-FIRL)

W78-10989

**WATER SUPPLIES FOR INDUSTRIAL FIRE PROTECTION.**  
Peerless-Midwest, Inc., Granger, IN.  
For primary bibliographic entry see Field 4B.  
W78-11070

### DRILLING IN THE YEAR 2025.

A. B. Stanley.  
Water Well Journal, Vol 32, No 6, p 55-57, June, 1978.

Descriptors: \*Drilling, \*Drilling equipment, \*Forecasting, Water wells.

The future of the water well drilling industry is predicted. Various well drilling machinery and water well equipment will undergo remarkable improvements. These include submersible motors, drilling rigs, drill bits, check valves, well screens, casings and points, pitless units, underground cameras, submersible pumps, underground tanks, and windmills. Drillers will begin to install more waste treatment systems and closed loop water reuse systems. The work of the water well driller should become easier and he should be able to drill more wells each year with the same number of employees. His position in the community will become more important as surface water shortages and pollution force a growing population to turn to groundwater and the person who can produce it. (Purdin-NWWA)  
W78-11072

### INCREASED PENETRATION RATES ACHIEVED WITH NEW EXTENDED NOZZLE BITS.

Shell Oil Co., Houston, TX.  
C. A. Pratt.  
Journal of Petroleum Technology, Vol 30, p 1191-1198, August, 1978. 11 fig, 1 tab, 8 ref.

Descriptors: \*Drilling equipment, \*Rotary drilling, \*Nozzles, \*Penetration, Drill bits, Drilling costs, Hydraulic tubes.

The importance of hydraulic effect on penetration rate has been known since 1940. It was noted that the total fluid impact force is inversely proportional to the distance from the nozzle. The first long nozzle for rotary rock bits experienced three problems: mechanical failure of the extender tubes; tube extensions too short to influence the bit performance; and long lead times required to manufacture some designs. A new extender-nozzle/center-jet (EN/CJ) bit was designed to be: strong enough to prevent breakage while entering the hole during drilling; long enough to reduce the distance between the jet nozzle and hole bottom to 1 1/2 inch; installed easily on standard bits; and flexible enough to allow changing the jet size at the well site. Field tests of the EN/CJ bits have shown that the hydraulic nozzle life with high weight mud systems should exceed 35 hours. Compared with standard bits the EN/CJ bits average a 28% increase in penetration rate. Also, they show a greater improvement for penetration rates on small-to-medium-sized rigs than on large rigs. EN/CJ bits will reduce drilling costs in most situations. The cost-per-foot savings is a function of both increased penetration rate and rig operation costs. (Purdin-NWWA)  
W78-11080

## 8E. Rock Mechanics and Geology

**INVESTIGATION OF ACOUSTIC BOUNDARY WAVES AND INTERFERENCE PATTERNS AS TECHNIQUES FOR DETECTING FRACTURES.**  
Shell Development Co., Houston, TX.

For primary bibliographic entry see Field 8G.  
W78-11081



## Field 8—ENGINEERING WORKS

### Group 8E—Rock Mechanics and Geology

#### 8F. Concrete

##### FILTER BED FLOOR TILES.

Water and Waste Treatment, Vol 21, No 6, p 31, June, 1978.

Descriptors: \*Filters, \*Tiles, \*Concretes, \*Cements, \*Filtration, Construction materials, Installation, Construction, Corrosion control, Sulfates, Waste water treatment, Municipal wastes.

E. C. C. Quarries Ltd. of Croft, England, has begun production of completely concrete filter bed floor tiles for waste water treatment plants. The precast filter tiles are constructed of sulfate-resistant cement concrete in an average scale of 2.5 tiles/sq m and up to 700 mm square. The tiles have a crushing strength above 50.0 Newton/sq mm at 28 days and are supplied with layout designs which include ducts up to 300 mm wide for solid bed floors. It is reportedly possible for two employees to install a floor 22 m in diameter within 8 hrs; lifting cradles for direct installation of the bed by a crane are provided. The floor tiles supply full coverage of the filter bed, maximum drainage, and basal aeration. (Lisk-FIRL) W78-10696

##### NEW GROUTING METHODS.

Ground Water Age, Vol 12, No 12, p 43-44, 56, August, 1978. 4 fig.

Descriptors: \*Grout curtains, \*Grouting, \*Concrete dams, \*Drilling, Reservoir leakage, Seepage, Concrete technology.

Three improvements in deep grout curtain construction were demonstrated at a Texas dam. They are: (1) drilling larger than normal grout holes; (2) mechanizing the preparation of the grout mix; (3) faster grout installation by use of flexible hose on grout reels. Using a truck-mounted rotary drill rig equipped with a 9 7/8-inch diameter roller cone bit, drillers rapidly put down larger than usual holes with penetration rates up to 120 feet per hour. Removal of cuttings was accomplished by use of an air-water injection system. A 1:1 water to cement slurry was transported from a batch plant by truck to a fully-mechanized grout handler and pumping unit consisting of twelve one yard, agitated holding tanks and three high capacity grout pumps. Flexible, braided hose was substituted for time-consuming rigid pipe, reducing hole preparation time from one hour to five minutes each. Some holes required more grout than others due to greater pore size. Unexpected clay strata also required adjustments in grouting. These innovative improvements of the grouting operation give away nothing in grout curtain effectiveness while boosting efficiency substantially, thus cutting costs. (Purdin-NWWA) W78-11086

#### 8G. Materials

##### ELECTROSTATIC WATER TREATMENT,

Electrostatic Equipment Co., Kansas City, MO. (Assignee).

For primary bibliographic entry see Field 5F.

W78-10708

##### FRICTION LOSSES IN CORRUGATED METAL PIPE.

Army Engineer Div. North Pacific, Bonneville, OR. Div. Hydraulic Lab.

For primary bibliographic entry see Field 8B.

W78-10934

##### COMPARISON OF VIBRATION TEST RESULTS FOR A MODEL AND PROTOTYPE ARCH DAM,

Army Engineer Waterways Experiment Station, Vicksburg, MS. Weapons Effects Lab.

For primary bibliographic entry see Field 8A.

W78-10937

##### PRODUCTS LIABILITY: LET THE SELLER BEWARE,

For primary bibliographic entry see Field 6E.

W78-11069

##### SEALS FOR GEOTHERMAL ROLLER DRILL BITS,

Terra Tek, Inc., Salt Lake City, UT.

R. R. Hendrickson, C. Carwile, L. Matson, and R. W. Winzenried.

Journal of Pressure Vessel Technology, Vol 99, p 614-618, November, 1977. 9 fig, 2 tab, 5 ref.

Descriptors: \*Geothermal studies, \*Drilling equipment, \*Drill bits, \*Sealants, Elastomers, Thermal stress.

Almost all geothermal drilling is done with unsealed roller drill bits. Drilling fluid provides cooling and retards abrasion but do little to lubricate bearings. Sealed drill bits are not feasible for geothermal application due to temperature limitations on the elastomer seals. Factors affecting seal life in a geothermal environment include: high formation temperature, heating due to friction, rotational eccentricities of the cutter cone due to bearing wear, abrasive particles drawn into the seal, and hydrogen sulphide gas in geothermal steam. These factors were simulated in seal tester. Several elastomer seals were tested and found to have varying temperature limits from 175 degrees C to 235 degrees C which are below the required temperature of 240 degrees C. Four heterogeneous seals were built and tested. They had a higher temperature limit than the homogeneous elastomer seals. Several metal-to-metal seals with a plasma coating will permit much higher sealing forces than would otherwise be possible. Use of a perfected 'geothermal' seal may allow higher rpm's and increased footage. (Purdin-NWWA) W78-11077

##### ENGINEERING ASPECTS OF GEOTHERMAL DEVELOPMENT WITH EMPHASIS ON THE IMPERIAL VALLEY OF CALIFORNIA,

California Inst. of Tech., Pasadena, Environmental Quality Lab.

For primary bibliographic entry see Field 4B.

W78-11078

##### INVESTIGATION OF ACOUSTIC BOUNDARY WAVES AND INTERFERENCE PATTERNS AS TECHNIQUES FOR DETECTING FRACTURES,

Shell Development Co., Houston, TX.

E. A. Koerperich.

Journal of Petroleum Technology, Vol 30, p 1199-1207, August, 1978. 9 fig, 1 tab, 20 ref.

Descriptors: \*Borehole geophysics, \*Fractures(Geologic), \*Sonic logs, Sound waves, Subsurface investigations.

While many techniques for detecting fractures in reservoir rock have been proposed and tested, no technique can accurately and consistently respond to fracture zones. Also, conventional sonic logs are less sensitive to vertical fractures than to horizontal ones. Two methods of detecting vertical fractures were tested. They are: measure amplitudes of the low frequency boundary wave traveling along the borehole wall between transmitter and receiver of an axially oriented array; investigate patterns of reflected or mode converted energy that may originate from acoustic discontinuities such as fractures. It was concluded that boundary wave amplitudes and interference pat-

terns recorded on an axially oriented acoustic logging tool are unreliable indicators of vertical fractures. These negative results are due to (1) vertical travel path of the acoustic waves, whereby vertical fractures provide negligible interruption to the path, (2) tool frequency, and (3) effects of mud cake. However, S-wave amplitude attenuation is an effective way to locate vertical fractures provided the transducer array is perpendicular to fracture planes. Under optimum conditions, interference patterns are visible on a variable density X-Z or a wiggle X-Y presentation. Interference patterns caused by boundary wave reflections are clearer and more numerous than patterns caused by P and S waves. (Purdin-NWWA) W78-11081

##### GEOTHERMAL DRILL BIT IMPROVEMENT-SPECIFIC APPLICATION TO THE GEYSERS,

Terra Tek, Inc., Salt Lake City, UT.

R. R. Nielsen, L. M. Barker, and C. Carwile. Journal of Pressure Vessel Technology, Vol 99, p 619-623, November, 1977. 6 fig, 4 tab, 5 ref.

Descriptors: \*Geothermal studies, \*Drilling equipment, \*Drill bits, \*Bearings, Steel, Thermal stress.

Current geothermal wells are drilled using conventional oil-well drill bits which are not designed for the high temperatures of geothermal reservoirs. Consequently, the average bit life is drastically reduced adding to the expense of geothermal drilling. A research and development program was undertaken to determine the weakness in the drill bits, improve them, and test them in the laboratory and the field. A study of used bits from geothermal drilling showed the major causes of failure were excessive bearing and gage wear. Research bits were developed by using steels with superior hot hardness for bearing structures. A test vessel was used to compare wear of conventional bits and research bits. Measured parameters included: pressure, water temperature, bit friction pin and roller bearing race temperatures, rpm, torque, and bit weight. The research bit tested under identical conditions showed five to ten times less bearing wear. Additional laboratory tests and field tests are planned. (Purdin-NWWA) W78-11082

##### INHIBITOR CUTS PIPE LOSS IN GEOTHERMAL DRILLING,

Union Oil Co. of California, Brea.

P. W. Fischer, and D. E. Pyle. World Oil, Vol 187, No 2, p 55-57, August 1, 1978. 4 tab, 12 ref.

Descriptors: \*Geothermal studies, \*Inhibitors, \*Drill pipe, \*Corrosion control, \*Erosion control, Drilling, Cost analysis.

Severe deterioration of drill pipe in geothermal drilling prompted Union Oil Co. to develop Unisteam, a corrosion-erosion inhibitor. Unisteam greatly reduces well costs by increasing drill pipe life and lowers the incidence of twist-offs caused by corroded pipes. Corrosion-erosion is caused by a combination of factors including high temperature, steam, water, salts, oxygen, and high velocity, abrasive drill cuttings. A material is needed to reduce the impact of abrasive cuttings and prevent the protective film from being eroded. This material, an amine resin, is totally water soluble at ambient temperature but becomes a viscous non-water soluble polymer above 250 degrees F. Tables itemizing pipe history using the inhibitor, drill pipe costs while air drilling, inhibitor injection rate, and inhibitor costs show a minimum cost saving of \$19,000 per well. Unisteam is also effective in liquid dominated geothermal reservoirs. Success requires maintaining fluid pH between 9.5 and 11 and injecting inhibitor at rates to maintain 40 ppm of inhibitor in the return fluid. Ammonium hydroxide is the most effective pH control agent, but environmental restrictions limit the amount. Sodium hydroxide is a safe alternative pH control agent. (Purdin-NWWA)

W78-11084

THE SUBTLE DEPT APPLI DEEP GEOT Los Alamos S J. H. Altseime Available from Service, 1302, Price c microfiche. R mitted to 11th ineering Con 12 fig, 11 ref.

Descriptors: studies, \*Su Wells, Comput

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GUIDE TO COMPLET Gulf Publish World Oil, tab. T. R. W

Descriptors: tary drilling.

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#### 8I. Fish

STATE OF SEVRUG: THE DAM LIC INSTA FOR ARTI L. V. Baden Gashchenko Journal of 1976. 6 tab,

Descriptors: \*Freshwater

## Preparation Of Reviews—Group 10F

W78-11084

**THE SUBTERRANEAN ROCK MELTING CONCEPT APPLIED TO THE PRODUCTION OF DEEP GEOTHERMAL WELLS,**

Los Alamos Scientific Lab., NM.  
J. H. Altseimer.  
Available from the National Technical Information Service, Springfield, VA 22161 as LA-UR-76-1302. Price codes: A02 in paper copy, A01 in microfiche. Report LA-UR-76-1302, (1976). Submitted to 11th Intersociety Energy Conversion Engineering Conference, September 12-17, 1976. 7 p, 12 fig, 11 ref.

Descriptors: \*Drilling equipment, \*Geothermal studies, \*Subterranean drilling, Rotary drilling, Wells, Computer models, Melting, Drill bits.

The Subterranean concept is a system of excavating and penetrating rocks or soil by melting and simultaneously providing rock fracturing, debris removal, and wall stabilization. Melting bits for different rock types have been tested and a number of small scale operations have been successfully conducted. A bit life of up to 100 hours has been obtained. However, rates of penetration are low, averaging only about 2 mm/s. A computer model, GEOWELL, was developed to compare the Subterranean concept with rotary drilling. The major technical and cost items used in GEOWELL include: well design, surface equipment, drill pipe, bits, electric power generation and transmission, drilling fluids, and hole support. The results of the analysis indicate that no insurmountable technical barriers exist. It is recommended that rotary and melting techniques be combined to realize minimum overall well costs. Well cost is affected more by penetration rate than by bit lifetime. The current rate has to be increased to at least .8 mm/s to match the cost of rotary drilling. (Purdin-NWWA)

W78-11085

**GUIDE TO DRILLING, WORKOVER AND COMPLETION FLUIDS, (1978-79),**

Gulf Publishing Co., Houston, TX.  
World Oil, Vol 186, No 7, p 53-98, June, 1978. 1 tab. T. R. Wright, Jr. editor.

Descriptors: \*Drilling fluids, \*Specification, Rotary drilling.

A comprehensive guide to drilling fluids is presented in tabular form which defines the basic system classification and function of over 1350 fluids. Also provided is a description of each material and the companies from which it is available. The definitions reflect general industry practice and terminology, and incorporate descriptions adapted by the American Petroleum Institute (API) and the International Association of Drilling Contractors (IADC), although no endorsement nor approval is claimed or intended. Low and high pH water-base systems, low solids systems, oil-base systems, and air, gas, mist systems are described. The various functions of fluids are explained. (Purdin-NWWA)

W78-11087

**81. Fisheries Engineering**

**STATE OF THE GONADS OF THE KUBAN SEVRYUGA ACIPENSER STELLATUS BELOW THE DAM OF THE FEDOROVSKIY HYDRAULIC INSTALLATION, AND ITS SIGNIFICANCE FOR ARTIFICIAL PROPAGATION,**  
L. V. Baden, G. G. Korniyenko, L. A. Gashchenko, and V. P. Shchigel'skaya.  
Journal of Ichthyology, Vol 16, No 4, p 583-591, 1976. 6 tab, 11 ref. (translated from the Russian).

Descriptors: Dams, \*Reservoirs, Forebay, \*Freshwater fish, Fish migration, Commercial

fisheries, Fish establishment, \*Fish farming, Fish behavior, Fish physiology, \*Fish handling facilities, Fish stocking, \*Sturgeons, Russia, \*Don River, Fedorovskiy hydraulic installation, Maturity, Mature fish.

The physiological state is described of the Kuban sevryuga, *Acipenser stellatus*, caught at different points of the spawning route (in the river delta and below the dam of the Fedorovskiy Hydraulic Installation) and the degree of maturity of the gonads established on the basis of a study of histological sections and the biochemical formation of the oocytes. The method of selecting mature fish for commercial breeding is described. The results obtained provide a biological basis for the organization of a more controlled and efficient fish-rearing establishment in the Azov-Kuban region. (Katz-EIS)

W78-10819

**FISH DIVERSION AND TRANSPORTATION SYSTEM FOR POWER PLANT APPLICATION,**  
Stone and Webster Engineering Corp., New York.  
E. P. Taft, and Y. G. Mussalli.  
Fisheries, Vol. 3, No. 3, p 2-5, May-June 1978. 2 fig., 1 tab., 4 ref.

Descriptors: \*Impingement, \*Intakes, \*Screens, \*Powerplants, Engineering structures, \*Bypasses, Equipment, Design, Mortality, Design flow, Hydraulic design, Cooling water, Electric powerplants, Laboratory tests, Fish barriers, Conveyance structures, Alosa.

An angled, flush-mounted traveling screen has been tested in order to determine its potential for alleviating fish impingement at the cooling water intakes of electric power plants. Laboratory studies have shown that an angled screen is 100% effective in diverting alewives (*Alosa pseudoharengus*) to a bypass and that these fish can be transported safely through a pipe and jet pump system with low resultant mortality. Such systems are presently incorporated in the design of two large power plants being constructed on Lake Ontario. (EIS-Katz).

W78-10999

**10. SCIENTIFIC AND TECHNICAL INFORMATION****10C. Secondary Publication And Distribution**

**INFORMATION EXCHANGE ON COMPUTER PROGRAMS (EXCHANGE D'INFORMATION DES PROGRAMMES D'ORDINATEURS),**  
International Inst. for Hydraulic and Environmental Engineering, Del Delft (Netherlands); and Waterloopkundig Lab., Delft (Netherlands).  
For primary bibliographic entry see Field 07C.  
W78-10664

**SEAGRASS LITERATURE SURVEY,**  
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.  
For primary bibliographic entry see Field 02L.  
W78-10958

**A SELECTED ANNOTATED BIBLIOGRAPHY ON THE ANALYSIS OF WATER RESOURCE SYSTEMS, VOLUME 8,**  
Office of Water Research and Technology, Washington, DC.  
For primary bibliographic entry see Field 06A.  
W78-11207

**SOCIOECONOMIC IMPACTS OF OUTER CONTINENTAL SHELF OIL AND GAS DEVELOPMENT-A BIBLIOGRAPHY,**  
Geological Survey, Reston, VA.

For primary bibliographic entry see Field 06G.  
W78-11232

**10F. Preparation Of Reviews**

**EROSION AND SOLID MATTER TRANSPORT IN INLAND WATERS SYMPOSIUM.**  
International Association of Hydrological Sciences, Paris (France).  
For primary bibliographic entry see Field 02J.  
W78-11113

**FACTORS INFLUENCING EROSION IN DISPERSIVE CLAY AND METHODS OF IDENTIFICATION,**  
California Univ., Davis. Dept. of Civil Engineering.  
For primary bibliographic entry see Field 02J.  
W78-11121

1. The first part of the document is a list of names and addresses, which are arranged in a columnar format. The names are written in a cursive script, and the addresses are written in a more formal, printed style. The list includes names such as "John Smith", "Mary Jones", and "Robert Brown", along with their respective addresses in various cities and states.

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*(continued from page 6)*



## CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Illinois State Water Survey.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

### **Supported by the Environmental Protection Agency in cooperation with WRSIC**

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

## Subject Fields



- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
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